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**ESSENTIALS OF A HEALTH PROGRAM**

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## Acute and Generalized Staphylococcal Infections

### Staphylococcus Antitoxin

From various sources there has been an accumulation of evidence which suggests that much of the symptomatology of acute staphylococcal infections is attributable to liberation of staphylococcus exotoxin within the body. The serious nature of such infections would appear to be due in large measure to the highly pathogenic effects of staphylococcus exotoxin upon living cells and tissues. Consequently, the use of staphylococcus antitoxin has been advocated in the treatment of acute and of generalized infections where there is evidence that *Staphylococcus pyogenes* is the causal micro-organism. (See the issues of The Canadian Medical Association Journal for June, July and August, 1934.)

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## Observations from an Epidemic of Acute Poliomyelitis in Sukkertoppen, Greenland

KAI HROLV, M.D.

*District Medical Officer, Randers, Denmark*

IN the summer of 1932, while serving as the medical officer of the Sukkertoppen district, I met with an epidemic of acute poliomyelitis comprising 83 definitely established cases. As the only physician in the district I was kept very busy and the long distances between the various inhabited places resulted in my having to rely to some extent on the statements of the inhabitants. The information obtained in this way, however, was used only with reservations.

It may be well to remind the reader that Greenland is inhabited only along the coast. The shore is rocky and indented with many fjords. The settlements are small and communication between them, except for walking distances, is by boat. The accompanying map shows the portion of Greenland concerned here. Godthaab is 115 miles south of Sukkertoppen, and Arsuk in South Greenland, not shown on the map, is about 230 miles farther south. According to the census of 1927, the Sukkertoppen district has a population of 1,363 Greenlanders and 17 Europeans; the Holsteinborg district, 876 Greenlanders and 7 Europeans.



FIGURE I

The Sukkertoppen District.

### HISTORY OF POLIOMYELITIS IN GREENLAND

Acute poliomyelitis is not a new disease in Greenland. From the records we find that in 1913 poliomyelitis occurred in Arsuk, South Greenland. In

the following year there was an extensive outbreak in Sukkertoppen, with a few scattered cases southwards to Godthaab and northwards to Holsteinborg. This infection was likely carried from Arsuk by way of Godthaab. In 1920 there were 7 cases in Egedesminde in July and August, with a few occurring in neighbouring dwelling-places. In 1925 there was a small epidemic in Angmagssalik in East Greenland. A few scattered cases in the Godthaab-Frederickshaab medical district were reported in the years 1927-1930. The disease is, however, not known with certainty to have appeared in Greenland since 1925.

*The Epidemic in Sukkertoppen, July-August, 1914*

There are no records of the number of cases but there were 37 deaths in this settlement of 700 persons. The author found 6 persons with post-poliomyelitis paralysis from this epidemic. The outbreak was preceded by an influenza-like disease. Reindeer hunters from the inland had suffered so markedly from this influenza-like disease that the reindeer hunt was a complete failure. They contracted poliomyelitis after returning to their dwelling-places, which would suggest that the preceding influenza-like disease was not an atypical form of poliomyelitis.

THE EPIDEMIC OF 1932

The 1932 epidemic commenced in the Sukkertoppen settlement on June 16th. At that time a convention of ministers and catechists was being held in Sukkertoppen with many visitors from the Godthaab and Sukkertoppen districts. By June 19th 7 cases had occurred, all except one being severely ill with paralysis. On June 19th a committee on epidemics was summoned with the "Landsfoged" (chief administrator of South Greenland). The committee closed all the schools and prohibited public gatherings. Isolation was ordered of the sick in the hospital and their housemates for three weeks at home. Disinfection of the houses of the sick was practised. The Sukkertoppen district was barred from communication with other settlements. Ships from Denmark were allowed to enter the harbour, deliver and receive mail, and discharge cargo by the crew alone, but all intercourse with persons on land was prohibited. Local coasting vessels were allowed to maintain the usual routes within the district but had strict orders not to have any personal intercourse with the inhabitants in the various places. Inhabitants from various dwelling-places in the district were requested to return home at once and to isolate themselves for ten days.

Other steps were taken to limit the spread of the disease to other centres. The most northern outpost in the Sukkertoppen district is Kangamiut. Communication is maintained all summer between this settlement and Holsteinborg by a motor boat carrying halibut. All shore intercourse with Holsteinborg was prohibited. Although there were Danes and Greenlanders visiting Sukkertoppen who were resident in Godthaab, no transmission of the disease was traced to them on their return home.

With these measures the Godthaab district was protected from poliomyelitis. The value of quarantine was shown in the experience of a children's sanatorium with 20 scrofulous children just outside Sukkertoppen and separated from the settlement by a bridge. Strict quarantine was maintained, no one being allowed to enter or to communicate with the attendants. I did not visit the sanatorium during the epidemic. No cases occurred in this institution.

In the Sukkertoppen settlement there were 17 clinically established cases. More than half the cases made their appearance during the first five days and, on the whole, the symptoms were far more severe than in the subsequent, more scattered cases. The five fatal cases all occurred among the early cases. Of the 17, only 3 escaped paralysis. Three patients were in one family. The eighth case that occurred was interesting. This patient lived alone with her parents at a distant fjord. She took ill one day after coming to Sukkertoppen and later died, the incubation period being apparently one day. The last case in Sukkertoppen, no. 17, was a patient who returned to Sukkertoppen on July 9th from Napassok. As the disease did not appear epidemically at Napassok until July 21st, her infection probably occurred in Sukkertoppen. The incubation period was from 10 to 14 days.

For two or three weeks there were some reports of headache among the children, accompanied by moderate constipation and a little fever (not exceeding 100°F.) lasting two or three days. None of these children were subsequently attacked by poliomyelitis. I had seen some similar cases in Holsteinborg in April and May and it is quite possible that these cases were the first cases in the epidemic. During the epidemic there were no other illnesses in the settlement. Nearly all the inhabitants, however, complained of headache and indisposition for two or three days during the epidemic, particularly the children. It is my belief that these persons were infected more or less without presenting definite symptoms of acute infection or signs of paralysis.

The first report of the disease outside of Sukkertoppen was in the village of Ikamiut, about eight miles distant. Here within one week, between June 21st and 28th, there were 5 cases, all in children. Four of these suffered paralysis and one died. The first patient was a boy 14 years old who was taken ill on the day after some apparently healthy persons had returned from Sukkertoppen to this dwelling-place. The patient died. In this case the incubation period was presumably one day and the infection was transmitted by apparently healthy carriers. In this dwelling-place there was only one case in each house, the many children of each family notwithstanding.

#### *Kangamiut*

The Kangamiut outpost is thickly settled and dirty. It is 40 miles from Sukkertoppen. The population is 300 and there were 13 unquestionable cases, 5 of whom died. As soon as the first case was known, the motor boat communication with Holsteinborg was stopped.

The first patient was a young man, 17 years of age, whose mother had returned from Sukkertoppen on June 21st. He had an incubation period of

9 to 10 days and took ill on July 1st. This case was infected by apparently healthy carriers. The other 12 cases all took ill within 13 days and were all children under 15 years of age.

In Kangamiut, as for that matter in all the dwelling-places outside the settlement, the regulations aimed at isolating the houses were not observed. This explains the relatively greater spreading of the disease there. There were 13 unquestionable cases of poliomyelitis among about 300 persons in Kangamiut, as compared with 17 cases among 700 persons in Sukkertoppen. Five patients died in each place.

#### *Timerdlet*

This dwelling-place is located about four miles from Kangamiut. The inhabitants traded in the Kangamiut store. Seven cases occurred in this place, all being under 15 years of age. The first case probably contracted the infection in Kangamiut. He took ill on July 3rd. On the following day there were 2 more cases and on July 5th 3 additional cases. The last case had his onset on July 8th, only five days after the appearance of the disease in Timerdlet. Four of these cases recovered without any permanent paralysis. The seventh case, after staying in bed one day, got up as he felt well, but was taken sick again two days later and died of respiratory paralysis on the following day.

#### *Agpamiut*

In this dwelling-place the first case of poliomyelitis made its appearance on July 2nd. The patient was a boy, 5 years old, whose father had returned from Sukkertoppen two days before. The infection was, therefore, transmitted through healthy carriers and the incubation period was one to two days. The patient died with ascending paralysis on July 10th. On July 11th a boy 18 months old had a mild attack. Six days later, on July 17th, a boy of 11 years had an even milder attack, not remaining in bed at all. In these two cases the incubation period was between 9 and 15 days.

#### *Napassok*

The first patient in Napassok, 35 miles from Sukkertoppen, was a boy of 14 years who was ill when he returned home from Sukkertoppen on June 21st. He did not feel sick until he was on his way in the boat. He had a very severe attack and now is only able to move about on crutches.

The second patient, a boy of eleven years, went home from Napassok to his dwelling-place, Ikerasok, on July 15th. He was taken ill the next day and had generalized paralysis. Undoubtedly he contracted the infection in Napassok. In Ikerasok there were, in addition, only two quite abortive cases later. These patients had no paralysis whatever. The fourth and fifth patients were brother and sister. The latter took ill four days after her brother. The eighth patient was a brother of the first patient and took ill 48 days after the brother. They lived together in the house throughout this period and he had not accompanied his brother on the visit to Sukkertoppen.

In attempting to determine the probable avenue of transmission, if the infection was transmitted by the first patient who took ill on June 21st on his return from Sukkertoppen, and from the occurrence of the second case on July 15th, the incubation period would appear to be 25 days. If the possibility of transmission by boat be considered, which appears likely, 8 to 10 days passed before the first case of the disease appeared. The skipper of the coast vessel had a daughter who was ill with poliomyelitis and who was admitted to the Sukkertoppen hospital on June 25th.

In Napassok the cases were more sporadic, which may be explained by the sparsely settled nature of the place and by the fact that the people, as requested, refrained from gathering together, being directed by a capable native trader and his wife who was an unusually kind and efficient midwife. It is also likely that those who returned from Sukkertoppen remained in isolation for ten days after their return as they had been instructed to do.

#### *Atangmik*

Atangmik is the most southern outpost and the most isolated place in the whole district. It is located 12 miles south of Napassok. This place was not in communication with the rest of the district until July 5th, when the catechist returned home from Sukkertoppen by a roundabout route, and on July 6th and 7th when the coasting vessel called.

There occurred only two diagnosed cases, on July 15th and 16th; that is, after an incubation period of at least 8 to 9 days. The first case was a youth of 17 years, who became ill on July 15th. The second case was a boy of 8 years who became ill on July 16th.

#### *Kangerdluarsuk*

Kangerdluarsuk, the dwelling-place nearest to the Sukkertoppen settlement (only about 5 miles distant), was the only dwelling-place in the district to escape entirely any manifest disease, in spite of the fact that it was in daily communication with Sukkertoppen. During the early part of the epidemic, however, the inhabitants of Kangerdluarsuk complained of headache and indisposition for two or three days. In 1914, during the previous epidemic, no less than four persons died of poliomyelitis in this little dwelling-place (numbering now about 50 persons, and a smaller number at that time).

#### *Holsteinborg*

The Holsteinborg settlement is 85 miles from Sukkertoppen and has about 400 inhabitants. The disease was undoubtedly introduced by the motor boat which carries fish from Kangamiut to the cannery at Holsteinborg. The last time that the boat called was July 5th. A brother of the first patient in Kangamiut was one of the boat crew, being himself apparently perfectly well. The disease, therefore, must have been conveyed to Holsteinborg by healthy carriers.

The first case of poliomyelitis in Holsteinborg made its appearance on

July 19th, *i.e.*, 14 days after the last possibility of infection from the motor boat.

OCCURRENCE OF CASES IN HOLSTEINBORG ACCORDING TO AGE

Date of onset:	19/7	21/7	22/7	23/7	25/7	26/7	27/7	28/7
0-1 years.....							IX*	
1-5 ".....	I*	II*			V			
5-15 ".....			III*	IV	VI	VII VIII	X	XI XII*

\*Patient died. Patients 5 and 6 were brothers, aged 5 and 3 years; patients 7 and 9 were brothers.

In the Holsteinborg settlement there were 12 established cases of acute poliomyelitis within 10 days with a fatal outcome in 5 cases. The disease spread to outposts and dwelling-places, 4 places only escaping the disease.

The disease appears to have been spread partly by the district boat and by private motor boats of Greenlanders who are known to have offended, in several places, against the regulation prohibiting going ashore.

#### *Isortok*

In Isortok, a very isolated dwelling-place, there were 3 cases, the first on July 25th, and 2 others, aged 6 and 4 years, on July 29th. The infection was introduced by the members of a fishing-boat from Holsteinborg who had considerable intercourse with the inhabitants on July 20th. The incubation period was 5 days.

#### *Sarfanguak Outpost*

The disease appeared here when two sisters, both under 5 years of age, were taken ill on August 1st. The infection may have been introduced by the district boat which put in to this outpost on July 20th and July 27th.

On August 8th a boy 12 years of age had an attack which terminated fatally. On August 10th a boy of 6 years had a serious attack of the disease with persisting paralysis of the legs. They were both taken ill while staying at a salmon stream up-country in a fjord, where they had been since spring. They were both carried home to Sarfanguak on August 15th, where one of them died. Undoubtedly the camping life and the transport back home aggravated the condition in these two cases. The salmon place had been visited several times by inhabitants from the dwelling-place Sarkardlet, which is only about five miles distant. In Sarkardlet there was not a case of the disease either before or after the illness of these two children. On July 20th, however, the salmon place had been visited by two healthy adults who had previously been in the Holsteinborg settlement. They stayed only one day at the salmon place. If these persons carried the infection to the place, as is most probable, the incubation period was 20 days.

#### *Sarkak*

This dwelling-place had only one case. A five-year old girl was taken ill

on August 6th. A schooner had visited the place on July 29th and several motor boats before this.

#### *Umanarsuk*

In this dwelling-place there were 2 cases in 2 children of the same family. A boy aged 4 years and his sister aged 6 were taken ill with a rather mild attack of the disease on August 9th and 11th, respectively.

#### *Ausakutak*

In the Ausakutak outpost, which is only about 5 miles from the Holsteinborg settlement, and with which there is communication over land (implying many possibilities of infection), there were 2 mild cases, a boy aged 5 years who became sick on August 7th, and a boy of 13 who was taken ill on August 8th. Later, according to information from Dr. Bense, there occurred 4 additional cases on September 1st and 2nd. All four children returned to this dwelling-place after spending the entire summer at a distant fjord (salmon-fishing). Three of these children belonged to the same family and were taken ill on the day of their return. The fourth was taken ill on the following day. One of them died and the others had severe disabling paralysis. Here, then, is an evident incubation period of one day.

#### SUMMARY

In the Sukkertoppen-Holsteinborg Medical Districts there were 83 cases with 20 deaths. Of those recovering, 27 suffered severe disabling paralysis, 17 paralysis of lesser degree, and 17 recovered without paralysis.

A striking feature of the epidemic was the fact that the oldest patients were 17 years old; that is, they were born in 1915. None of the persons living in Sukkertoppen and Holsteinborg during the poliomyelitis epidemic in 1914 were taken ill this time. Further, only 2 infants were attacked by the disease in this epidemic. This fact may perhaps be explained as resulting, in part at any rate, from a degree of immunity acquired from the mother, as all the mothers were living in 1914. Such immunization must have been effected through the presence of a large number of abortive cases of the disease. That such abortive cases are numerous is supported by the observations in this epidemic, for a great many persons complained of indisposition and headache. It would also appear from this study that the possibility of infection from healthy carriers or from abortive cases may persist for weeks, as shown in the instance of the last case in Sukkertoppen, the last case in Napassok, and the last cases in Ausakutak.

There is, in this epidemic, no suggestion that the infection may be spread by fomites.

The incubation period may be set as being from 1 to at least 20 days. There were several instances in which the disease was ascertained positively to have appeared on the day after the first possible infection; namely, the first patient in Ikamiut, a young girl who returned to Sukkertoppen and was taken ill the following day, and the children who came home to Ausakutak.

Another striking feature of this epidemic was that the first patients in every place presented the more severe cases. The fatal cases were nearly always among the first that occurred. Likewise, when several children of a family were attacked, the later cases were usually milder.

### FINDINGS

From this study the following findings are presented:

1. Definite immunity was conferred by both manifest and abortive attacks of poliomyelitis; no person who went through the epidemic in 1914 showed any symptoms of the disease in 1932.
2. There was a general and rapid spreading of the infection in the various dwelling-places throughout the community, with high morbidity but largely abortive cases. The epidemics were therefore of short duration.
3. Infection from patients with manifest disease was rather insignificant.
4. The disease was spread from apparently healthy carriers, from the abortive cases and from the sick in the incubation stage, presumably by droplet infection.
5. Isolation measures were often taken too late, but they were useful when established promptly and energetically enforced.
6. The incubation period varied from 1 to 14-20 days. Generally the shorter the incubation period the more severe was the disease, and the longer the incubation period the milder was the disease.
7. The three-weeks' quarantine adopted in Denmark for healthy persons who have been exposed to infection would appear to be too short; six weeks would seem a more satisfactory minimum. Six weeks' quarantine for patients would be fully adequate.

### POLIOMYELITIS

#### SUKKERTOPPEN-HOLSTEINBORG MEDICAL DISTRICTS

June 16-August 9, 1932

Place	Cases	Deaths	Date of First Case	Duration of Epidemic
Sukkertoppen.....	17	5	June 16th	33 days
Ikamiut.....	5	1	June 21st	7 "
Napassok.....	8	0	June 21st	48 "
Kangamiut.....	13	5	July 1st	13 "
Agpamiut.....	3	1	July 2nd	15 "
Timerdlet.....	7	1	July 3rd	5 "
Atangmik.....	2		July 15th	2 "
Holsteinborg.....	12	5	July 19th	9 "
Isortok.....	3		July 25th	4 "
Sarfanguak.....	4	1	Aug. 1st	
Sarkak.....	1		Aug. 6th	
Ausakutak.....	6	1	Aug. 7	26 "
Umanarsuk.....	2		Aug. 9th	3 "
Total.....	83	20		

# Essential Features of a Health Program\*

AS SEEN BY A PROVINCIAL MEDICAL OFFICER OF HEALTH

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IN any consideration of this subject there is agreement at once that the official provincial health organization should be constituted as a department of the government with a full recognition of the principle that health is fundamental. How long have we proceeded on the assumption that health is but a secondary consideration in our planning, and with what costly results!

The Provincial Department of Health should be so organized and directed as to give leadership in all public health work in the province, serving not only to initiate and carry forward health programs soundly based and wisely planned but also to integrate the work of local health agencies, both official and non-official. If the Provincial Department is to provide such leadership, it is essential that there be an adequate staff available which is thoroughly qualified, well trained, and properly remunerated, and it is essential that the provincial health executive have freedom of choice in the selection of the staff engaged in such a vitally important activity as that which concerns the health of the people.

We find to-day a marked inequality of health service in different communities. In the foreword to the report of the New York State Health Commission in 1932, President Roosevelt, then Governor of the State of New York, wrote:

"One reason for the existence of such inequalities is found in the unevenness of popular sentiment for health action. For example, although much has been done against tuberculosis, relatively little has been done to abate syphilis, which is a comparable disease as regards its prevalence in the population, and the economic losses resulting from its spread. Cancer, too, although the second most frequent cause of death, receives little attention from the public at large. . . . Important as it is, however, that costs of Government be reduced where possible during these trying times, it is even more important that health service be available where service is sorely needed. The Commission has analyzed carefully the cost of local health boards as well as the work they perform, and has reached the conclusion that much more service now urgently needed can be purchased with the same dollar now spent by the utilization of state aid already available. Under present laws a modern well rounded health protection service can be set up at a cost from local taxes no greater than present expenditures which are even more wasteful of lives

*\*Part of the symposium, "Essential Features of a Health Program," presented before the Public Health Nursing Section at the Twenty-fourth Annual Meeting of the Canadian Public Health Association, Toronto, June, 1935.*

than of money. If by this means there were accomplished but the single service of cutting in half again the present tuberculosis death rate, the modest net increase in state expenditures required for state aid to county health departments would be more than balanced by the reduction of present expenditures for the hospitalization of patients with tuberculosis."

Both the town and the village, as well as the single rural municipality, are unsuitable as a unit of government in dealing with the health problems of the present day. The type of local municipal organization set up in 1885 is entirely unsuitable to provide the health service of 1935. The organization of health work by the establishment of county or district health units serving all municipalities embraced in such units is the solution of the problem of making modern preventive health services available in our rural districts and smaller urban centres. Cities of 50,000 or more population should constitute units in themselves. All municipalities included in such units should be represented on a county or district board of health. This board should be responsible for the administration of the health services of the unit. It is essential that the unit medical officer of health, as well as all personnel employed, should give full-time service and should be adequately trained. In my opinion the time has arrived when legislation should be enacted to provide that only persons who are qualified by special training of a recognized standard, approved by the head of the provincial health service, should be eligible to receive any health appointment, either local or provincial. The Provincial Department of Health should act in a supervisory and advisory capacity, and an adequate staff of well-qualified supervisors should be available to provide the necessary assistance and advice to the local health units. Federal and provincial financial aid should be extended to such county or district health units on a per caput basis. In my opinion no more effective contribution to the health of the citizens of Canada could be made than by providing such financial assistance as would insure the establishment of such full-time preventive health units throughout our country. Decentralization is an essential feature of an effective health program. Health services are of such an intimately personal nature that, to be effective, they must be administered by a local authority. While there may be certain circumstances and certain problems with which the central health authority can deal more effectively, generally speaking people to be served must have a personal interest in, and responsibility for the type and quality of service they receive.

There is need for clearly defined objectives in all public health work. This applies to both the official and voluntary agencies. There should be established in every city and county or district a Council of Health composed of representatives of all agencies engaged in public health work. By the establishment of such a clearing house much overlapping and duplication of health service could be prevented and much unproductive work eliminated.

There is need for a provincial Advisory Committee of Health, which should be appointed by the provincial Minister of Health or the Minister responsible for the administration of public health services. Such a committee should be

composed of representatives of the medical faculty of the university, the School of Hygiene, the medical profession, the dental profession, the nursing profession, the public health engineering profession, the veterinary profession, the teaching profession, and all other professions having to do with public health, either directly or indirectly. Industry and labour should be represented on such a committee, and representative lay persons should also be members of this committee. The Advisory Committee of Health should meet at least annually at the call of the Minister and, as its name implies, its status should be that of a purely advisory committee to the Provincial Department of Health. By means of such a committee the Provincial Department of Health would be enabled to obtain the advice of those who are leaders of public opinion in their respective fields, and through them to inform and educate the public in regard to the policy and the program of the department.

The first great achievements in public health in this generation were made by the application of measures designed to protect the people en masse. When effective steps were taken to safeguard our water supplies, the typhoid death rate fell from forty to less than one per 100,000 population. When measures were enforced to improve the quality of our milk supplies and the safeguard of pasteurization was employed, there was an immediate decline in infantile mortality, a decline which has continued with the improvement and extension of other methods of child conservation. With the progress in the development of what we might term mass public health work during the last twenty-five years, the problem of the future has been revealed as that not only of maintaining mass health, but of instituting a program which will insure the fullest measure of personal health for the individual citizen. The widespread interest in the subject of health insurance to-day is an indication that health educational work carried on by official and unofficial health agencies in recent years is beginning to bear fruit in a public demand that the barriers to health be removed and that every citizen be given the advantage of modern facilities for the maintenance of health. Health insurance is a subject which is being widely discussed to-day. It is essential that before any system is devised and put into effect it be given the most careful study and thorough trial in order that we may make certain not only that the system proposed is economically sound, but that it will operate to insure modern scientific medical and health service of the highest standard.

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# Tuberculosis Control Abroad

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IN studying public health administration in other countries with particular reference to tuberculosis control, one must take into consideration certain factors, otherwise one might tend to be overcritical or overenthusiastic. We must consider the traditions of each country, the economic status of the people, the various bequests from the past, the national prejudices, the general standard of education, the type of government, public health organization, the standard of scientific investigation, the prevalent diseases, the available capital, etc. These considerations will allow one to understand better the health work of each country and to select the phases which might be applicable to one's own community.

A bird's-eye view would indicate that from a tuberculosis control standpoint our vision has been a little too limited and that there should be an attempt to appreciate all the influences that affect the problem of tuberculosis directly and indirectly. Consideration of the tuberculosis problem involves the person with definite tuberculosis, persons who are in contact or are suspected of having tuberculosis, arrested cases, suspected cases, and persons presumably well. Problems of bacteriology and immunology and of treatment are approached in research programs.

In the past we have given probably 90 per cent of our attention to those who constitute about 10 per cent of the problem; namely, persons afflicted with the disease. At first we thought only of these. Sanatoria were built and every effort was made to establish a cure. Methods of treatment improved and in what seemed almost a hopeless disease cures were effected. We then began to examine contacts, a large group whose status in regard to infection or developed disease was unknown. Among them were found cases who had not yet become ill but who had minimal infection. Instead of finding far advanced tuberculosis at the first examination we were diagnosing early tuberculosis. Thought was given next to the arrested case. However, this phase of the problem has not received sufficient attention and much remains to be done. Educational campaigns have been conducted for years, but it is astounding, considering the time and effort that have been devoted to developing methods of presenting essential information, how few communities have adopted any planned health campaign. Sporadic efforts are, unfortunately, the rule.

In the spread of tuberculosis the person with active disease, the quiescent or supposedly arrested case, the contact or suspect, are the sources of infection. Much more attention could be given profitably to limiting the transference of the germ from these sources to well persons. Sanatoria, clinics, hospitals,

orthopedic and paediatric institutions, village settlements; the services of physicians, surgeons and nurses; the state provision of unemployment relief and mothers' pensions; the contribution of social workers—each plays its part in the endeavour to solve the problem. It is essential to have co-ordination of all these activities, and we might well direct some of our efforts to obtain this co-ordination.

One wonders how much thought we have given to the well person in the past. Possibly by thinking more broadly of public health work from day to day we could do a great deal more. For example, there is the question of general sanitation and its effect on tuberculosis or any other communicable disease. It is recognized that the improvement in general sanitation has been responsible to a very considerable extent for the reduction of our death rate from certain communicable diseases. Then there is the question of housing—the number of people living in one dwelling and in one room, and the contacts made, etc. There is also the question of milk, water, and food supply. The importance of our school medical service, child welfare, maternal welfare, and dental services in disease prevention must be recognized. These all should be correlated in any anti-tuberculosis activity.

How are these various phases of the problem approached in the different centres of Europe?

#### SCOTLAND

##### *Glasgow*

Glasgow, with a population of more than one million people, has an area of 30,000 acres, a density of 36 per acre. In 1933 the city had a birth rate of 20.8 per 1,000 and a death rate of 14.7. There are approximately 40,000 cases of communicable diseases annually. At the time of our visit there were 7,000 known cases of tuberculosis of record, there being reported annually about 700 cases of pulmonary tuberculosis and 900 cases of non-pulmonary tuberculosis. All the tuberculosis work of the city and districts is under one department, a division of the city health department, which controls practically all the health activities of Glasgow. There are few places where health departments are considered of greater importance than in Scotland. Here the health department is well organized and apparently controls everything but the voluntary hospitals; and from the financial state of some of these institutions it would appear that it will not be long before these too are controlled by the department. The department is responsible for child welfare and the control of tuberculosis, venereal diseases, and other communicable diseases and mental diseases, and much of the hospital work in the city is under its control. The budget for the year is slightly greater than £1,000,000.

In Glasgow the bed provision for tuberculosis patients is approximately one per death and an attempt is made to make the number of beds fit the number of cases; the more cases the less time the individual spends in an institution, so that the length of residence in institution depends on the number of cases reported. There is no hesitation in sending positive-sputum cases home. The authorities do not appear to believe that tuberculosis is as communicable as it is considered to be on this continent. They rely to a great extent on the training of the individual and consider that a trained patient

can be looked after quite safely at home. They appear to have a different type of tuberculosis as there are many more acute cases. Their surgery and active treatment, from our viewpoint, would seem to need a great deal of stimulation, as they consider that only 5 per cent of cases are suitable for pneumothorax, and they find that 60 per cent of all tuberculous cases die of tuberculosis.

There is no rehabilitation work in Glasgow, twenty full-time district nurses being engaged exclusively in tuberculosis work. The department is in favour of the full-time specialized public health nurse.

### *Edinburgh*

In Edinburgh, a more residential city, the work is carried on in very much the same way as in Glasgow. The city is slightly larger than Vancouver, the population being a little over 400,000. The tuberculosis death rate is 71, with 322 tuberculosis deaths in the past year. The birth rate is 15.1 per 1,000, with a total death rate of 13.2. The city covers 32,000 acres—a population of 13.9 per acre. There are tuberculosis dispensaries and hospitals, and any taxpayer may get free treatment in a tuberculosis institution. As in Glasgow, the tuberculosis department receives an annual grant from the city plus an annual block grant from the Health Department of Scotland. There is also a grant for supplying nourishment to the undernourished and underprivileged tuberculous patient. Much interesting work is being conducted in the University of Edinburgh and in some of the large hospitals.

### ENGLAND

London, with nearly ten million people, is divided into 28 boroughs, each with its local health organization. There are also many voluntary hospitals, each working independently. Under the London County Council, whose authority covers Greater London, 64,000 hospital beds are provided and laboratory services are co-ordinated to serve adequately the many hospitals providing this accommodation.

The tuberculosis mortality for England and Wales was 33,658 in 1932. Between the ages of five and forty-five tuberculosis causes one-third of all deaths in males and one-half of all deaths in females in England. The large population, the congestion of dwellings which still exists in areas in many cities, the necessity of utilizing old buildings in spite of the extensive rehousing program, present many difficulties. Progress is being made slowly but definite results are being achieved.

It is interesting to recall the development of the tuberculosis program in England. In 1867 a scientific investigation of the tuberculosis problem was conducted. Royal Commissions were appointed in 1880, 1901 and again in 1908. The school medical service was established in 1907. Notification of tuberculosis was required by law in 1908 and physicians working under the Poor Law were required to report cases. In 1911 it was required that all cases of tuberculosis be reported and in the same year the National Insurance Act was passed. In 1911 the Departmental Committee on Tuberculosis was appointed but little progress was made for some time.

Schemes for the treatment of tuberculosis applying to the whole population, insured and uninsured, were carried out by county and borough councils. The Local Government Board, which was the responsible department of the National Government for the administration of health matters until the Ministry of Health was created in 1919, acted as the subsidizing and advisory body. Grants were given by the Board to local authorities to assist in the establishment of institutions for the treatment of tuberculosis, the payments being made from a sum of £1,500,000 as provided under the Finance Act of 1911 for this purpose. The annual cost of a tuberculosis scheme was defrayed in the first instance by the local authority. Payments were made from the Insurance Committee and half of the net deficit was met by the Local Governing Board.

When it was established in 1919 the Ministry of Health fell heir to the responsibilities and functions previously exercised by the Local Government Board and by the Insurance Commission. The act of 1921 imposed on county councils the duty of providing a scheme for the treatment of tuberculosis in their areas. The Local Government Act of 1929 abolished percentage grants to local authorities, substituting a block grant and making local authorities more autonomous in their services. It is felt that the block grants are ideal and that this act of 1929 has been the most important factor in stimulating antituberculosis work. They consider that the advantages of co-ordinating the preventive and therapeutic aspects of tuberculosis work under one administrative head are obvious. This is now generally recognized throughout the country. They have shown that the campaign against tuberculosis must not be regarded as an isolated subject but that it is essentially an integral part of public health and that every measure calculated to promote the health and well-being of the community is a contribution toward it.

The Ministry of Health, appreciating the many problems confronting it in the tuberculosis field, has drafted what it considers to be an ideal plan. Every effort is being made to adapt the present facilities into this more or less idealistic scheme. The following quotation presents the views of the Ministry:

"The danger still exists of too narrow an outlook on tuberculosis and of regarding an isolated method of treatment—sanatorium treatment, tuberculin treatment, etc.—as a panacea. Social measures again, for example, housing, are urged as the one solution; in the absence of proper precautions and suitable economic conditions infection will take place in hygienically built houses as well as in slum tenements. All methods of attack have their part but they are inter-dependent and cannot stand alone. The outlook on the problem must, therefore, be broad and wide. To attack tuberculosis in an individual, even at the earliest stage recognizable by the clinician, means that the battle already inclines to the side of the enemy. Tuberculosis must be fought *ab initio* by putting the individual into a sound state of bodily defence, of bestowing upon him a healthy environment and by removing the conditions calculated to favour tuberculosis infection.

"The dispensary is to be regarded as the centre and pivot of the whole tuberculosis scheme. It is an organization, not merely a building for an isolated form of treatment. Its tentacles closely embrace every general measure of preventive medicine as well as all particular measures for combating tuberculosis. It is the receiving house and centre of diagnosis; the clearing house and centre for observations; the centre for curative treatment; the centre for examination of contacts; the centre for 'after care' and the information bureau and educational centre."

The great importance of the selection of patients for different forms of

treatment and for different types of institutions is stressed in England. There are different types of residential institutions: (1) the sanatorium-hospital, (2) hospitals, (3) homes for advanced cases, and (4) hospitals for the treatment of other forms of tuberculosis. In some institutions in England one will see all types of tuberculosis being treated in the same institution; for example, bone and joint tuberculosis is considered an integral part of the treatment of tuberculosis in a planned scheme. Some patients are suitable, at the time that the disease is recognized, for sanatorium treatment. A second and larger proportion require a period of initial treatment in either a tuberculosis hospital or a nursing block of a sanatorium before they are suitable for strict sanatorium treatment. The third group of patients are suitable for treatment in a tuberculosis hospital. In the remaining patients the disease at the time of the initial examination is too advanced and extensive for sanatorium treatment. Palliative treatment in a tuberculosis hospital is the usual requirement.

In assaying the results of the sanatorium treatment they have found that in many cases the results of so-called sanatorium treatment have been worthless because the patients have not been properly selected and the distinction and inter-relation between hospital and true sanatorium has been ignored or imperfectly appreciated. The main obstacle to the efficiency of sanatorium treatment has been the failure to provide adequate treatment and care of the patient during the critical years that supervene after the discharge from sanatorium or tuberculosis hospital. We should be attempting in every way possible to protect the investment we have made in each case and do all within our power to prevent breakdowns, which not only require a second period of institutionalization but may permit an open case of tuberculosis to reinfect others with whom he is working, thus creating a vicious circle in our problem.

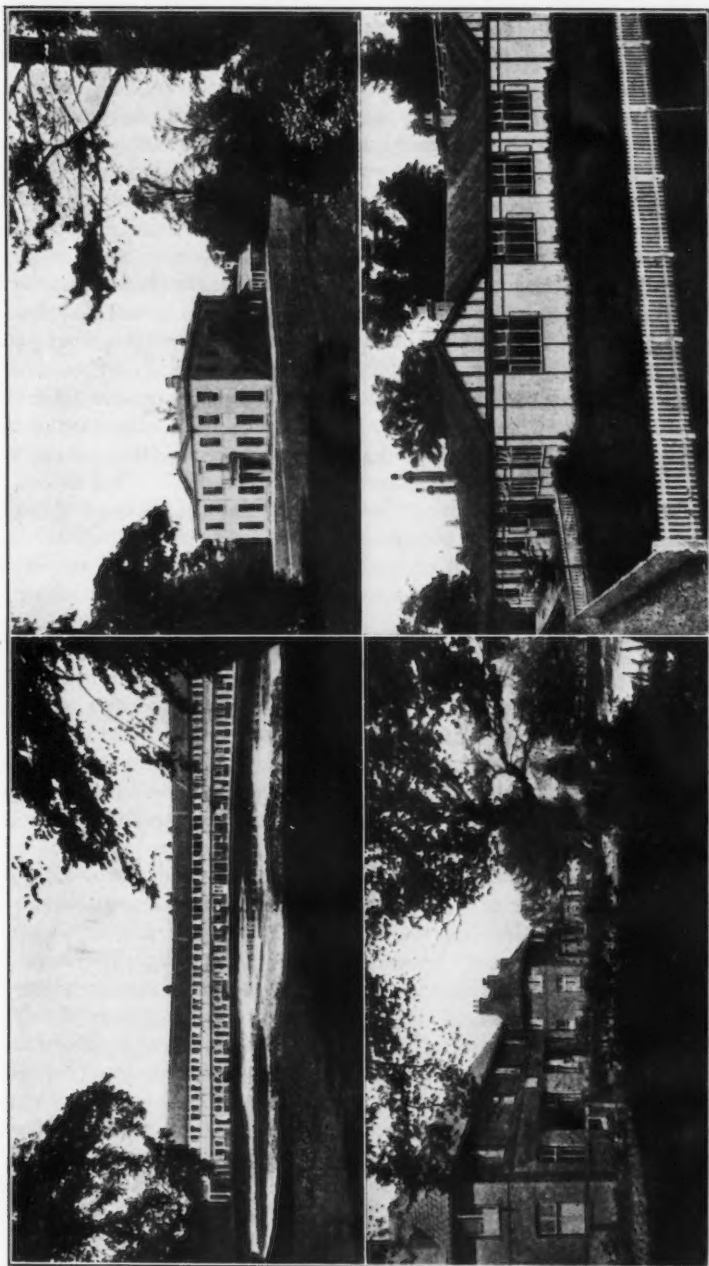
In England they have faced the after-care problem and have developed several village settlement schemes. I had the privilege of visiting two of these, namely, Papworth and Preston Hall. Both are marvels of ingenuity in practical achievement and are at least an attempt to solve this phase of the problem.

The considered opinion of the British Ministry of Health is that the village settlement, grafted on a hospital-sanatorium scheme, is the most hopeful means of ensuring the after-care and well-being of a certain proportion of patients suffering from tuberculosis.

We all know that a great deal of benefit derived from treatment in residential institutions is frequently lost and the risk of early relapse is incurred if a patient returns to unsatisfactory conditions of life and work; and we must realize that tuberculosis is not only a disease of the individual but that it brings coincidental family and social problems which should be given attention in each household, and are frequently as important in the interests of the patient and the family as the medical treatment of the individual sufferer.

#### *Papworth Village Settlement*

Papworth Village Settlement is beautifully situated in Cambridgeshire, occupying 350 acres, and is under the direction of a most able and enthusiastic man, Sir Pendrill Varrier-Jones.



## PAPWORTH VILLAGE SETTLEMENT

ABOVE, *Left*—The Princess Hospital for Women. *Right*—Papworth Hall, Showing Administrative Block.  
 BELOW, *Left*—Cottages in the Village. *Right*—St. John's Hostel. <sup>1</sup>

The administration block is part of an old estate and near at hand are two large buildings, the Bernhard Baron Memorial Hospital for men and the Princess Hospital for women. Along the main road are memorial cottages, more than 100 in all, in which the families live. Farther down the road one passes the Papworth store and enters the industrial section, composed of the travelling goods factory, the carpentry department, and the cabinet-making department, with the printing and upholstery departments adjoining. Nearby is a small building used entirely for the care of patients with tuberculosis of the glands, bones and joints, and not far from this is the village hall where patients may spend their spare hours enjoying motion pictures, concerts, etc.

This colony was opened at Bourn in 1916 and was transferred to Papworth in 1918. In the first year Papworth's industries paid £174 in wages and sold £401 worth of goods. In 1933 the same industries paid £25,000 in wages and executed work to the value of £88,000. During the period of Papworth's existence no less than £645,000 worth of work has been done and £228,000 has been paid in wages to tuberculous men and women who otherwise would have been forced first to accept public assistance and then to die prematurely and in conditions conducive to the spread of infection.

A patient enters the central institution for a probationary period of treatment. He remains in hospital until he is considered able to work a few hours a day without undue fatigue and without detriment to his condition. He is then given an opportunity to choose a trade in which to be instructed, or, if he is a skilled man and his trade is one of those carried on by the industries, he is given an opportunity to follow it for a few hours a day. He is then transferred to the sanatorium and lives in a shelter. As he progresses he is able to earn a little pocket-money, which not only gives him an incentive to do his best but inspires him with new hope for the future. Later, when his health progresses, he may be transferred to a hostel where the working hours are increased and the regime is not so strict. Finally, he may apply for discharge to the village settlement and be put on a rate of pay in accordance with his skill and sufficient for his maintenance.

Preston Hall, another village settlement, is situated in Kent. It was originally chosen as the seat of activities which had as their object the training and settlement of tuberculous ex-service men. At first the scheme was not the success that was anticipated. Accordingly, Sir Pendrill Varrier-Jones was invited by the British Legion to come to Preston Hall in 1925 and reconstruction was undertaken. Dr. McDougall, the present director, was appointed to the institution in 1927, and Preston Hall has been successful. It is a real inspiration to the visitor, a demonstration of what may be accomplished by perseverance, enthusiasm, adequate direction and initiative.

The central section of the settlement has accommodation for 280 patients and is fully equipped to deal with all modern methods in the treatment of tuberculosis. Its surgical unit, an important addition, was opened in 1933.

Preston Hall is ideally situated from an industrial standpoint, for within a radius of fifty miles there are no fewer than ten million people. It is just 35 miles from London on the main London-Folkestone Road, approximately 80,000 people passing its door each week. All stages of tuberculosis are re-

ceived at this institution and it is stated that about 35 per cent of all patients remain a purely medical problem, employment for them of any kind, in the settlement, being out of the question. About a third of the patients received here are not likely to reactivate on return to their previous employment. There is, therefore, the balance of approximately one-third of the cases, which remain medical and economic responsibilities.

It is impossible, of course, to absorb all such cases in village settlements throughout England, for it is estimated that about 12,000 men per annum are discharged from sanatoria. If only ten per cent of these were suitable for village settlements, it would mean an accommodation for 1,200 people.

The population of the settlement is approximately 600. Of these 168 are settlers, 126 wives and widows, and the rest dependents.

The industries are divided into the construction of portable buildings, printing, graining, and the manufacture of travelling goods and soap. Between 1925 and 1933 goods to the value of £449,704 have been marketed at the settlement and divisions, and £146,853 has been paid in wages.

The two settlements are an attempt to solve, at least in part, the after-care of certain groups of tuberculous cases. They are undoubtedly not applicable to every community, but one could not pass through them without realizing that the problem of after-care is not insurmountable if thoughtfully worked out for each given community. It is undoubtedly a problem of tremendous magnitude and we should endeavour to study it from every angle, attempting to bring about some sort of solution.

Throughout England the importance of educational work for the general public is realized and a very fine series of pamphlets, describing in an interesting way the various problems from the standpoint of tuberculosis and general public health, has been produced. The radio is used extensively, the Central Council for Broadcasting having prepared a program of talks on health and other educational subjects which are available to all the schools throughout the country. School children in many communities have a regular hour each day or week to listen to broadcasts given by leading authorities. They have also attempted to plan public health campaigns, something to which we in this country should be paying more attention. It would seem wise always to have a plan of action, and in our tuberculosis work and health work a great deal more would be accomplished if we planned health campaigns at least one year ahead and prepared for our general health work some years in advance.

London abounds with places of medical interest. The Brompton Chest Hospital is doing a large amount of chest surgery. Here one will see as radical surgery as anywhere in the world, but the results appear to be very good. One is just a little astonished to see active, open cases of tuberculosis in a four-bed ward with lung abscess, carcinoma, etc. The problem of infection seems to perturb no one.

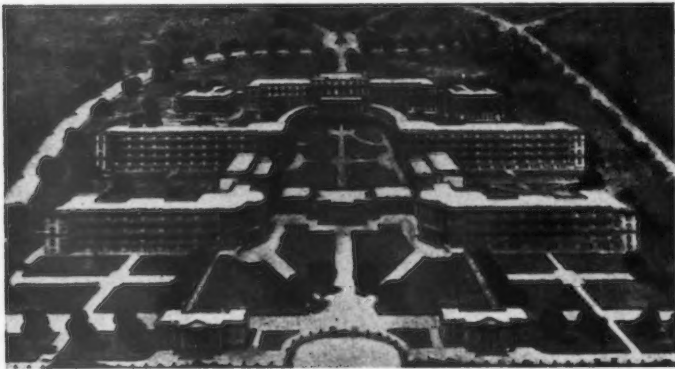
#### FRANCE

In France the most interesting development in recent years has been BCG vaccine, prepared at the Pasteur Institute, Paris. They are most enthusiastic

regarding the use of this product. I am sorry to say that I could not become imbued with their enthusiasm. They have been working for some years with it and over one million children have been inoculated. They state that the mortality is 8.5 among non-vaccinated children and 4.7 among vaccinated. However, in compiling these statistics, social conditions seem to have received little consideration. A child when inoculated is isolated immediately after birth and for a period of at least ten weeks. This period of isolation alone would, of course, reduce mortality. I believe that our attention to-day should still be devoted to preventing tuberculosis rather than attempting to immunize through such methods of inoculation, at least until a more accurate means of measuring dosage is established and cases are followed over a longer period of time.

#### ITALY

Italy is attempting one of the greatest public health experiments the world



ITALY'S NEWEST SANATORIUM IN ROME

has known. In a few short years Italy has advanced remarkably, particularly from the standpoint of tuberculosis. Mussolini realized very early in his administration that health was of fundamental importance. Just six years ago he started on an intensive public health campaign which has made Italy one of the cleanest countries of the world and has gone a long way towards the solution of their tuberculosis problem. It was found that the three leading causes of death were tuberculosis, heart disease and cancer. Of these, tuberculosis was the easiest of approach and also was considered the most important because it was afflicting the youth of the country, those in whom the nation had made a financial investment and who were being cut down at the time of life when they were about to make a return on the investment made. Mussolini stated that:

"The public spirit, while understanding the economic importance and the vastness of the problems, eagerly and faithfully watches the work of the Fascist Government, which has made the control of tuberculosis one of the fundamental objects of its activities, and it is absolutely necessary that men of science, legislators and philanthropists form a kind of unified front in

order to lead the people to a victorious end. The fight against the most severe and widespread disease which challenges humanity has been taken up on the whole line, and also here the Fascist Government marches at the front."

Funds have been developed by introducing a Tuberculosis Insurance Law. During the years 1929 to 1933 they have spent 1,645,309,330 lire. This sum does not include either seaside and mountain colonies or the national physical educational program for the younger generation. They have attempted to make their scheme a complete one and institutions have been established under the following headings: provincial dispensaries, preventoria, permanent colonies, tuberculosis hospitals, hospital wards, sanatorium hospitals, institutions for extra-pulmonary forms, climatic sanatoria, nursing homes, day sanatoria, open-air colonies, post-sanatorium colonies and work colonies.

In 1929 there were created 571 such colonies and in 1933 there were 2,032. In 1929, 102,000 people and in 1933, 385,000 people received care. The significance of co-ordinating their tuberculosis work with their child welfare, maternity welfare, school and general public health program has been fully realized. Their educational work is most intensive, being carried out through the medium of the schools, moving pictures, newspapers and posters. Anti-tuberculosis drives, arranged annually, have been held. The first netted 7,530,000 lire and the last 18,000,000 lire. Many of the slums have been demolished, being replaced by modern dwellings of the finest type. Their tuberculosis institutions are undoubtedly the finest in the world, a recent one having just been completed at a cost of almost 10,000,000 lire.

In 1927 there were 54,000 deaths from tuberculosis and in 1933 there were 35,400, a decrease of almost 20,000.

It has been extremely interesting to see these different countries and to learn what they are doing. There are many wonderful developments in medicine taking place to-day; new findings in bacteriology and physiology, new chemical discoveries and a further application of physics to medicine. One of the greatest advances that is being made to-day throughout the world is the improvement in public health work. We have been confining our attention too long to the sick person without considering sufficiently how disease may be prevented and attempting to give safety and security to the well individual in the community. The battle of tuberculosis is still going on the world over and still challenges mankind. Our banner should have the word PREVENTION written in capital letters upon it and we should attempt to correlate all our efforts in an endeavour to bring this disease to its irreducible minimum.

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# The History of Public Health in Saskatchewan

R. O. DAVISON, M.D.

*Deputy Minister of Public Health*

PRIOR to 1905, when Saskatchewan was created a province, public health was a responsibility of the North West Territorial Council and was administered mainly by the North West Mounted Police. As early as 1877 an ordinance was passed respecting infectious diseases. This was followed during the years 1878-81 by ordinances respecting the registration of marriages. Registration of births and deaths, as well as marriages, was provided for in 1888. In 1898 an ordinance was passed providing for the appointment of medical officers of health and sanitary inspectors in the cities and towns of the North West Territories. In 1902 the Public Health Ordinance was amended and later was adopted at the first session of the Legislature of the Province of Saskatchewan in 1905. The history of public health in Saskatchewan therefore extends over a period of approximately thirty years. In developing its public health organization, Saskatchewan had for guidance the experience of the older provinces of the Dominion, but it must be recognized that a comparatively new path had to be hewn out and with limited financial resources to smooth out the road.

In the year following the establishment of the province the late Maurice M. Seymour, M.D., D.P.H., was appointed Provincial Medical Health Officer under the Minister of Agriculture. For three years, with occasional help from the Mounted Police, he carried out such measures as were necessary in the control of communicable disease. With the rapidly increasing settlement of the province, such control was entirely inadequate and indicated the necessity for local health organization as well as a central governing authority. With the passing of the first Public Health Act by the Legislature in 1909, such local health organizations were required and the direction of public health work in the province was placed in a Bureau of Public Health under the Hon. George Langley, Minister of Municipal Affairs. Prior to the passing of this act the health administration was under the Department of Agriculture. Dr. Seymour continued to direct the work as Commissioner of Public Health.

By the act every municipality, whether rural or urban, became a health district, its council constituting a health board, with a medical practitioner as medical officer of health with full responsibility for the enforcement of health regulations. The activities of the local health units were directed and coordinated by the Bureau, which also acted in advisory and supervisory capacities as well as providing a clearing-house for all complaints relating to health.

Dr. Seymour, as Commissioner of Public Health, had associated with him a Council of Public Health for the purpose of considering and reviewing rules and regulations made under the act. The first council consisted of the following medical officers of health: Wm. J. McKay, M.D., C.M., Saskatoon;

E. E. Meek, M.D., C.M., Regina; A. R. Turnbull, M.D., C.M., Moose Jaw; and F. W. Whybra, V.S., Prince Albert.

Early in 1910 Mr. T. Aird Murray, C.E., was appointed Consulting Engineer and Assistant Commissioner of Health, and Mr. Thos. Watson, A.R. San. I., Medical Inspector and Provincial Sanitary Engineer.

The Public Health Act conferred wide powers, so that in 1910, the year following the passing of the act, regulations were in force for the control and notification of communicable disease and for the improvement of sanitation throughout the province.

Amendments to the Public Health Act were made during the following years and in 1919 the act was consolidated and amended. In 1921 the Hon. Mr. Langley was succeeded by the Hon. J. M. Uhrich, M.D., as Minister in Charge of the Bureau of Public Health. The Department of Public Health was created by a statute passed in 1923. The Hon. Dr. Uhrich was appointed the first Minister of Public Health and Dr. M. M. Seymour became Deputy Minister. The Council of Public Health, which had functioned as an important part of the public health organization since 1909, was continued under the new act. According to the act, the Council consists of the Deputy Minister, three medical practitioners, a qualified veterinary surgeon, and a civil engineer. The members are appointed to hold office for two years and receive remuneration from public funds.

Under the leadership of Dr. Seymour the work of the Department was steadily enlarged, the activities including the providing of more adequate treatment facilities in tuberculosis, immunization against smallpox and diphtheria, the development of municipal hospitals, child welfare, venereal disease control, and health education. Saskatchewan was the second province in Canada to undertake the free distribution of public health biological products, commencing the distribution of diphtheria antitoxin in 1917. In 1921 Dr. Seymour made a health survey of the far northern limits of Saskatchewan. Through his untiring efforts he laid the foundations for the present health organization of the province. On November 1, 1927, having reached the retiring age, he was appointed Special Adviser in Public Health to the Government. Following the provincial elections in 1929, the Hon. Dr. Uhrich was succeeded by the Hon. F. D. Munroe, M.D., C.M., and F. C. Middleton, M.D., D.P.H., was appointed Deputy Minister. As Special Adviser, Dr. Seymour continued active interest in the work of the Department until his sudden death on January 16, 1929.

In 1930 the Saskatchewan Cancer Commission Act was passed and a cancer control program was actively undertaken. Other important legislation has been enacted during recent years, including the creation of a Health Services Board in 1934 for the purpose of collecting information on the needs of the people with respect to all health services as well as to confer and advise with municipalities, employers, and employees regarding such matters, including the consideration of methods for the equitable distribution of the cost of illness. This Board is composed of the Minister and the Deputy Minister of Public Health, the Chairman of the Local Government Board, the Deputy

Minister of Municipal Affairs, and the Commissioner of the Saskatchewan Division of the Canadian Red Cross Society.

Following the elections of 1934 the Hon. F. D. Munroe was succeeded by the Hon. J. M. Uhrich, M.D., formerly Minister of Public Health, and R. O. Davison, M.D., Director of the Division of Communicable Diseases and Deputy Chairman of the Cancer Commission, was appointed Deputy Minister of Public Health.

To review briefly the progress of public health in the province, the development of each of the present divisions of the Department of Public Health is presented.

#### VITAL STATISTICS

The collection and tabulation of vital statistics in Saskatchewan began in 1878 when registrars of deeds were required to keep returns of marriages. In 1888 electoral districts were created registration divisions and provisions were made for the registration of births, marriages and deaths. Administration was placed under the Department of Agriculture in 1897 where it remained until transferred to the Bureau of Public Health in 1914. At that time there were 313 registration divisions in the province. The work of this division was under the supervision of Mr. Stuart Muirhead, who entered the service of the Bureau of Public Health at the time of the transfer from the Department of Agriculture and continued his duties as director of this division until his recent retirement. During this period the work of the division has been greatly extended.

On July 1, 1916, a new Vital Statistics Act was passed creating each municipality as a separate registration division with the secretary-treasurer as registrar and making registration of all births, marriages, and deaths compulsory. Power was given to prosecute persons neglecting registration. When in 1919 a model Vital Statistics Act was approved by the Dominion Council of Health it was found that the Saskatchewan Act of 1916 followed the provisions so closely that only minor changes appeared advisable.

Through this division valuable information has been obtained by special enquiries which have been made for some years concerning maternal and infant deaths and all deaths from diphtheria and from accidents in the province.

In 1933 a new Marriage Act was passed by the Legislature and the administration transferred from the Department of the Provincial Secretary to the Department of Public Health. The act contains an advance in health legislation in that a medical certificate is required from the male applicant before a license is issued. Idiots, imbeciles, or those suffering from chronic mental disease or disease in a communicable state are barred from receiving a license.

#### PROVINCIAL LABORATORY

The Provincial Laboratory was established in 1905 under Dr. G. A. Charlton by the Department of Agriculture as a result of a request from the College of Physicians and Surgeons of the North West Territories for facilities in confirming their diagnoses in various diseases. In its early work the

Laboratory was engaged not only in the examination of diphtheria cultures and other public health procedures but in performing germination tests for seed grain and conducting investigations in swamp fever among horses and in other veterinary problems.

In 1918 it was transferred to the Bureau of Public Health and since that time has been essentially a public health laboratory providing a laboratory service free of charge to registered physicians in the province, including tissue diagnosis, bacteriological and chemical examinations of water supplies, and medico-legal examinations for the Attorney-General's department. In 1922 Dr. Frances G. McGill was appointed Director of the Laboratory, after serving as Bacteriologist for some years. In 1933, 36,498 specimens were examined by the Laboratory, indicating the extensive use which is made of its services by physicians throughout the province and constituting the largest number of specimens examined in any year.

#### SANITATION

The Public Health Act of 1909 provided that before any scheme for establishing a water supply or sewage disposal works could be undertaken, the plans and specifications had to be approved by the Commissioner of Public Health. At that time a number of the larger municipalities were considering the construction of sewage disposal plants. Valuable assistance was given by the Bureau through Mr. T. Aird Murray, C.E., who was appointed in 1910 as Consulting Engineer, continuing as consultant until his death in 1919. Mr. R. H. Murray, C.E., was appointed Resident Sanitary Engineer and assumed the direction of the Division of Sanitation when the division was created by Order-in-Council in 1920. In this position he has continued to develop further the services of the division. With the organization of the Bureau of Public Health in 1909 Mr. Thomas Watson, A.R. San. I., was appointed Provincial Sanitary Inspector, rendering valuable services throughout the province until his retirement in 1925.

This division is concerned primarily with maintaining a healthful environment for the people of the province. Its engineers and inspectors supervise public waterworks and sewerage systems, and municipal milk supplies, and advise on the provision of pure air and food and all conditions which make for a healthy community.

There is invested in Saskatchewan a sum of over \$15,000,000 in municipal waterworks and sewage disposal plants. These works, if they are carefully controlled and scientifically supervised, represent so much health protection for the people of the province, but if through neglect, lack of repair, indifferent maintenance or failure to provide extensions for the needs of increased population they fail in the purpose for which they were constructed they may readily become a menace to health. Statistical returns show that the death rate from typhoid fever per 100,000 population has fallen from 33.0 in 1911 to 2.2 in 1934 and this decrease is largely due to the control of water supplies and stream pollution.

The supervision of safe milk supplies for the people of the province has also received the close attention of this division. By-laws for pasteurization, the licensing of milk vendors and the testing of cattle for tuberculosis and contagious abortion are being passed by many municipalities and gradually the elimination of milk-borne disease is becoming an accomplished fact.

#### COMMUNICABLE DISEASES

##### *Tuberculosis*

As early as the Annual Report of 1908 of the Bureau of Public Health the Commissioner, the late Dr. M. M. Seymour, made definite recommendations for a campaign against tuberculosis. An excellent record of the early development of the anti-tuberculosis program in Saskatchewan is presented in the following quotation from a paper recently published by Dr. R. G. Ferguson, Director of Medical Services and General Superintendent of the Saskatchewan Anti-Tuberculosis League.

"In Saskatchewan this publicity campaign was begun by the late Dr. M. M. Seymour, then Provincial Health Officer, and Dr. George Porter, then Secretary of the Canadian Tuberculosis Association. Small tuberculosis organizations were formed throughout the province for the purpose of educating the people regarding tuberculosis and for the purpose of raising funds for building a sanatorium. This was followed in 1911 by the formation of a Provincial Anti-Tuberculosis League under the presidency of Mr. Peter McAra. This, a voluntary organization, raised some \$97,000.00 by public subscription as a start for the building of the first sanatorium unit at Fort Qu'Appelle, which unit accommodated sixty patients.

"The task of building adequate sanatorium accommodation proved too great for voluntary effort. Under the pressure of need for accommodation for soldiers returning from overseas, the Board of Directors of the League, under the leadership of Mr. A. B. Cook, secured the financial assistance of both the Provincial and the Dominion Governments in order to extend and complete the first sanatorium at Fort Qu'Appelle."

By 1919 the sanatorium known as Fort San had accommodation for 300 beds and in the following year the Imperial Order of the Daughters of the Empire provided additional accommodation for 70 children at this institution.

"A commission was appointed in 1921, under the chairmanship of Mr. A. B. Cook, to survey the whole problem of the treatment and control of tuberculosis. Following the report of the commission, the government, the municipalities, the medical profession, and other interested bodies agreed to co-operate for the dual purpose of adequately caring for those already sick and of preventing the spread of this disease. At this time the government undertook to provide further future sanatorium accommodation and a per diem hospital grant of one dollar per patient per day.

"Then came the realization by the public that few victims of this disease could financially afford the prolonged treatment required. As a result of this a pool was formed in 1923 to care for indigent patients from rural municipalities. A similar pool was formed in 1925 by the urban municipalities to

care for indigent urban patients. By 1928, roughly 70 per cent of the population of the province were providing for the care of their indigent tuberculous sick through one or other of these pools.

"At this time not more than 10 per cent of those who fell sick with tuberculosis were able to provide for the cost of their own treatment. Realization of this fact on the part of the public led to resolutions being passed by municipal bodies and other organizations asking the Provincial Government to provide for treatment at the expense of taxes. This necessary financial provision was realized when the Sanatoria and Hospitals Act of 1929 was passed by the Provincial Government to provide for the treatment of all tuberculous sick at the expense of taxes. This provision for adequate sanatorium accommodation and for adequate financing of the cost of treatment marked the accomplishment of the second essential in the anti-tuberculosis campaign."

In 1925 a new sanatorium at Saskatoon with accommodation for 165 patients was provided and in 1928 a sanatorium at Prince Albert with accommodation for 236 patients was opened. In addition to the sanatorium beds, government-aided hospitals throughout the province are required to provide at least one-tenth of their bed capacity for tuberculous cases if needed.

As a result of the operation of this program, with facilities for free treatment during the past four years, there has been a reduction of 25 per cent in the tuberculosis death rate. There has also been a reduction in the number of new active cases discovered—from 1,143 in 1931 to 879 in 1933. The proportion of early cases has increased from 14.3 per cent in 1928, prior to free treatment, to 25.4 per cent in 1933.

The infection among children and young adults in 1934, indicated by the tuberculin test, as compared with a survey made in 1921, shows a reduction in the young adult group from 76 per cent to 23 per cent, based on examination of normal school students, and a reduction in the school age group from 51 per cent to 14.08 per cent.

### *Trachoma*

From the inception of the Bureau of Public Health in 1909 attention has been given to the control of trachoma. As early as 1912 a physician was appointed to give his entire time to the treatment of the disease and in the report for that year 712 cases are recorded as having received treatment. Treatment and supervision have been provided by physicians and nurses, and during the year 1933, excluding the Indian population in which the disease is prevalent, 244 cases of trachoma in 124 families were treated in clinics operated by the Department. Forty-seven additional cases were reported by private physicians, the disease being reported in 35 municipalities. The care of the Indian population is a responsibility of the Federal Government.

### MATERNAL AND CHILD HYGIENE AND PUBLIC HEALTH NURSING

Special attention was directed to child welfare in 1916 by the provision of preschool clinics. In 1919 three public health nurses were appointed to

organize and conduct home nursing classes and to give educational addresses in prenatal care, care of the baby, and the general care of the sick. These classes were organized through the co-operation of the various women's organizations throughout the rural areas. As early as 1915 child welfare exhibits were prepared and shown at the Provincial Exhibition in Regina, and in the following years similar exhibits were shown at various fairs.

On May 1, 1928, the Nursing Branch of the Department of Education was transferred to the Department of Public Health and, with the three nurses already employed, formed the Public Health Nursing Division. Miss Ruby Simpson, Reg.N., was appointed Director of this division. The work of the nurses is generalized public health nursing and a definite area of the province is assigned to each.

#### *Maternity Grants*

In 1920 provision was made for a maternity grant of \$25.00 for needy expectant mothers to assist them in securing the services of a physician or hospital care in confinement. Of the amount \$10.00 was given to the mother previous to the time of confinement in order that she might procure the necessities for the event and the balance of \$15.00 was paid to the doctor or the hospital, as the mother directed. The amount expended in providing these grants steadily increased until during the fiscal years 1930-31 \$64,000 was expended. Owing to economic conditions and the increasing cost, the grants were discontinued in 1931 and a layette, with certain supplies for the mother, substituted. On October 15, 1934, the grant was restored and it is hoped to render this aid a more effective measure by making its authorization contingent not only on the financial needs of the mother but also on prenatal and postnatal examinations by a physician.

#### VENEREAL DISEASES

Following the action taken by the Dominion Government in 1919 to provide financial assistance to the provinces to assist in establishing facilities for the treatment of venereal diseases, the Legislature passed the Venereal Disease Act, which required persons infected to report to a physician for treatment within a specified time and to remain under treatment until pronounced cured.

In the following year with the assistance of the Dominion Government four full-time and four part-time dispensaries were opened in different sections of the province, providing free treatment. Three of these clinics were discontinued within the following three years and at present four full-time clinics and one part-time clinic are in operation. The essential drugs for treatment are supplied free of charge to physicians for the treatment of patients who are not able to pay for them or who are unable to report at a dispensary.

#### MENTAL HYGIENE

Mental hygiene became a public health activity in this province in 1931,

when Dr. J. W. MacNeill, Superintendent of the Battleford Mental Hospital, was made Commissioner of Mental Services with the responsibility for the supervision, prevention, treatment and care of mental defectives and persons suffering from mental diseases; the examination of those committed to jails; and the establishment of mental hygiene and child hygiene clinics and a system of parole for selected cases.

Psychopathic wards accommodating 20 patients were opened in December, 1930, in connection with the Regina General Hospital. The public were encouraged to make use of these facilities as they would those of any general hospital for the relief of physical ailments. It was hoped to reach early border-line cases and thereby reduce the number who would otherwise find their way to a mental hospital.

All matters pertaining to the care and treatment of patients in the two mental hospitals were taken over by the Department of Public Health on May 1, 1930.

The Child Welfare Act of 1927 made provision for the admission of mentally defective children to a training school at Weyburn while in July, 1930, similar care was made available for persons over sixteen years of age.

#### FULL-TIME HEALTH UNITS

An amendment to the Public Health Act in 1928 provided for the formation of health units if co-operation could be secured from at least eight rural municipalities and the towns and villages within their borders.

One unit was inaugurated and commenced operation in March, 1929, with Gravelbourg as headquarters and serving a population of 23,000 over an area of 2,600 square miles. The municipalities contributed one-half of the cost while the Provincial Government and the Rockefeller Foundation shared the remainder equally.

The work was entirely preventive, the staff consisting of a medical health officer, a sanitary officer, a public health nurse and a secretary-technician.

Several successive crop failures forced the municipalities to withdraw from the scheme on termination of the three-year contract, but the unit had already demonstrated its value and with the return of normal conditions it hoped that new units may be established.

#### CANCER

In March, 1930, the Legislature passed the Saskatchewan Cancer Commission Act and in June the Commission was appointed, consisting of the Hon. F. D. Munroe, Chairman; Dr. R. O. Davison, Deputy Chairman; and Dr. David Low, Commissioner. A vote of \$115,000 for radium and \$30,000 for administration was provided, and in December, 1931, a consultative diagnostic clinic was opened in the Regina General Hospital. A second clinic was opened in January, 1932, in the City Hospital, Saskatoon.

Patients must be referred by their attending physicians for consultation and to date approximately 2,500 patients have attended the clinics. Educa-

tional work having in view both the public and the medical profession and laying emphasis on the importance of early diagnosis and early efficient treatment has been an active part of the work of the Commission.

#### MUNICIPAL DOCTORS

Where adequate medical attention is not available, legislation for a number of years has made it possible for a rural municipality to offer an annual maximum financial inducement of \$1,500 to a physician to locate there or \$1,000 in the case of a registered nurse. Fifty councils have adopted this method.

An alternate plan provides that a rural municipality may submit a by-law to its electors for the full-time employment of a physician at a maximum salary of \$5,000 a year.

This contract, which must have the approval of the Health Services Board, established in 1934, usually requires that the doctor serve as medical health officer and that he provide free medical treatment to resident rate-payers, organize immunization clinics, and examine all school children. Sixty-six municipalities have taken advantage of the scheme while several others have passed the necessary by-law.

The salary paid to the physician varies from three to five thousand dollars. Based on the latter amount, the yearly cost is about \$3.85 per quarter section or a per caput expense of \$2.50 in an average municipality of 2,000 people.

#### HOSPITALS

At the time of the formation of the province in 1905, Saskatchewan had six hospitals representing an investment of \$39,940. Their combined bed capacity of 75 cared for 1,078 patients during that year. By 1915 the number had risen to 28, while ten years later 44 institutions provided treatment for 37,504 persons. In 1933 close to \$10,000,000 was invested in buildings and equipment of 68 hospitals. These institutions had 3,961 beds or 4.2 per 1,000 population and hospitalized 6 per cent of the people of the province during the year.

Of the 28 hospitals operating in 1915, 11 were situated in the 7 cities and accounted for 73 per cent of the total bed accommodation. It soon became evident that provision would have to be made for hospital care of the rural and semi-urban population and an agitation on the part of the country people to have their own institutions independent of city hospitals brought about the passing of the Union Hospital Act in 1916. This act was revised in 1919, and whereas the act had previously provided for the co-operation of complete rural municipalities with urban centres towards the construction of a union hospital at a point to be mutually agreed upon, the new Union Hospital Act provided that any number of complete rural municipalities or portions of municipalities might co-operate with any number of urban municipalities to establish a union hospital, the boundaries of the district and the situation of the hospital being defined by the Lieutenant-Governor-in-Council.

Saskatchewan was the first province in Canada to pass legislation for hospitalization on a co-operative basis. The success of this act is demonstrated by the fact that there are now 21 union hospitals in operation in the province with a total capacity of 443 beds. In many of these hospitals "free treatment" is in force, the cost of the hospital care being provided by an annual tax on the ratepayers of the municipality.

#### LEGISLATION

The Department of Public Health at the present time administers the following statutes: The Public Health Act; The Vital Statistics Act; An Act respecting Solemnization of Marriages; An Act respecting Union Hospitals; An Act to Regulate Public Aid to Hospitals; An Act to Provide for the Establishment of a Permanent Cancer Commission; An Act to make Further Provision for the Care of Certain Mentally Defective Persons; An Act respecting the Control and Prevention of Venereal Diseases; and An Act respecting Sanatoria and Hospitals for the Treatment of Tuberculosis.

A comparison of the appropriations for all health work, including aid to hospitals, for the year 1906 with the year 1933 reflects the growth of the province and of the essential health services. In 1906 the total appropriation was \$27,000 and in 1933 \$1,111,045, or \$1.17 per person. This amount included \$605,248 for hospitals and sanatoria and \$282,693 for mental hospitals. The population according to the census of 1911 was 492,432 and in the census of 1931, 921,785.

### Fourth Annual Christmas Meeting

#### LABORATORY SECTION

Royal York Hotel, Toronto

MONDAY and TUESDAY

DECEMBER 30th and 31st, 1935

*Program on page 613*

# Some Aspects of the Chemistry of Silicosis\*

C. M. JEPHCOTT, M.A., PH.D

*Division of Industrial Hygiene, Ontario Department of Health*

THE element silicon next to oxygen is the commonest of all the known elements. It is almost always found combined with oxygen in the form of silicon dioxide or with oxygen and the metals in the form of silicates. It is estimated that silicon dioxide represents about twelve per cent of the lithosphere and that the total of the silicon dioxide and the silicates represents nearly sixty per cent. On account of the widespread occurrence of silicon compounds, they are a cheap source of raw material and thus have a wide economic importance.

For the purpose of clarity, it is advisable at this point to define what we mean by the term silica. To avoid ambiguity, the word silica will be used to denote the total of the free and combined silica. Silicon dioxide will be used to denote free silica only and silicate will be used to denote combined silica only. It is hoped that a definition of these terms and the use of this nomenclature will lead to a better understanding of this paper.

Siliceous rocks and minerals encountered in industry and mining may be classified into three main groups. The first group includes those materials which are composed almost entirely of some form of silicon dioxide. Under this heading such substances as quartz, sand, sandstone, flint, chert, diatomaceous earth and tripoli may be included. All of these materials have a similar chemical composition but differ in physical properties. Some of these substances are familiar to all of us. Flint and chert in commercial quantities are found chiefly in England and are varieties of silicon dioxide which possess no definite crystalline structure. Diatomaceous earth is a hydrated form of silicon dioxide and is composed of myriads of siliceous shells of small marine organisms known as diatoms. The variety of tripoli which is found in the United States has, to the unaided eye, all the appearances of diatomaceous earth but the typical structure of the minute diatoms is absent. Group two may be called mixed exposures where silicon dioxide and one or more of the silicates occur or are used together. Such an occupation as granite-cutting serves as a good example of this type. In group three are put the silicates. Under this heading are placed such materials as kaolin, feldspar, mica and talc. In addition to the hazards occurring in the mining and quarrying of all these siliceous materials, there is the hazard associated with their use in such industries as rubber, soap, cosmetic, paint, pottery, enamel, paper, glass, textile, brick, steel and carborundum.

Most people who have studied the problem consider that the inhalation of minute particles of silicon dioxide is the chief cause of silicosis. Thus the occu-

*\*Presented before the Academy of Medicine, Toronto, Section of Preventive Medicine and Hygiene, October 27, 1935.*

pations which are reckoned to be the most dangerous to health include those where the various forms of silicon dioxide are used. In general, we may say that group one contains the most harmful and group three the least harmful materials.

#### *Dusts as a Health Hazard*

Various factors must be determined before an accurate evaluation of a health hazard can be made. It is not the total mass of dust in the air that is important but the number of particles less than ten microns in size. As only particles greater than sixty microns in size can be seen by the unaided eye, it is readily realized that a harmful exposure may occur where no visible dust is present.

Recently, Jones<sup>1</sup> of the Imperial College of Science of London, advanced the theory that a hydrated potassium aluminium silicate known as sericite was the chief agent in the causation of silicosis. It is best perhaps to quote his own conclusion:

"It is submitted that it is mainly the presence in the exploited rocks and materials of fibrous minerals be they sericite, sillimanite, tremolite, etc. (or a fibrous form of silicon dioxide as in chert or a fibrous rock as in pumice) in aggregates which during the impact of drilling, blasting or crushing become freed into the atmosphere as individual fibres, that enables sufficient material in the course of time to enter the lungs to cause silicosis. It is not suggested that sufficient minute particles of quartz could not under any circumstances enter the lungs to cause silicosis, although the cases here investigated appear to show conclusively that they have not done so, but it is maintained that fibrous minerals hasten the process so very considerably that their presence in the exploited rocks and minerals is of far greater importance in causing this disease than is the presence of silicon dioxide."

Although this conclusion engendered a great deal of interest, it has not been accepted as yet.

Cummins<sup>2</sup> of the Welsh National School of Medicine, Cardiff, suggests that the first broad differentiation which it seems necessary to make is that between dusts which are chemically active and dusts which are inert. He states that chemically active dusts must necessarily be soluble to a greater or less extent in the body fluids and it is upon this solubility that their activity depends. Of course this does not mean that soluble dusts are necessarily dangerous. On the other hand, the inert dusts are insoluble in the body fluids and therefore cannot exert any chemical action in the lung tissues. They may, however, if they accumulate to any marked extent exert the mechanical action characteristic of foreign bodies and thus lead to a certain amount of diffuse fibrosis.

Generally speaking, the lung tissue after death presents to the investigator a record of the mineral particles breathed in during life. If the activity of a dust depends upon its gradual solution, the examination of the lung residues is likely to disclose a larger proportion of the inert and insoluble minerals than of the chemically active and relatively soluble minerals to which the more important pathological lesions are actually due. The persistence of a given substance in the lung tissue with its excess in the lung residues does not in itself constitute a proof of its aetiological importance.

If, for instance, sericite were proved to be insoluble or almost insoluble in the body fluids, its mere presence in the lungs would be no argument in favour of its role in the production of lung fibrosis. Like inert coal dust it might accumulate in the lung tissues yet be chemically harmless, in contrast to silicon dioxide which is known to be sufficiently soluble to set up pathological changes. The problem of the soluble mineral constituents of inhaled dusts in relation to the pathological response which they elicit, calls for further careful study by both chemists and pathologists.

At this point it may be interesting to mention the results of some experiments performed by Kettle.<sup>3</sup> He showed that while kaolin or china clay (aluminium silicate) alone when introduced into the lungs of guinea pigs does not cause pulmonary fibrosis within a period of 500 days, yet when it is used in combination with dead tubercle bacilli it gives rise to characteristic lesions in as short a time as 112 days. However, as Kettle says, it remains to be seen whether similar lesions would result from the action of dead tubercle bacilli alone or in association with inert dust. He points out that silicosis is nearly always associated with tuberculosis and his experience in England leads him to place increasing importance on the infective factor.

#### *Silica and the Body*

As has been previously mentioned, a large part of the earth's crust is composed of siliceous rocks and minerals. In addition to this, silica is a constant constituent of all our foodstuffs whether of animal or vegetable origin and is even present in the water we drink. The Chicago Board of Health reported in 1931 that there was an average fall of siliceous matter of 134 tons per month per square mile. From this figure it can be seen that city dwellers during their life inhale appreciable amounts of silica. Silica is present in all organs of the human body, including the nails and hair, and it is quite possible that it is an essential constituent of animal protoplasm.

The entrance of silica into the body is by way of the alimentary tract and the lungs. Most of it present in the intestinal tract is eliminated in the faeces but a small amount is absorbed into the blood stream, as shown by the constant excretion of silica in the urine. This urinary excretion depends upon the diet and in normal adults averages about 1 mg. per 100 cc. of urine. This constitutes a daily output of approximately 15 mg. and a yearly output of slightly more than 1/6 of an ounce. King<sup>4</sup> showed that in a group of 56 Ontario gold miners the urinary excretion of silica was more than twice the normal quantity, and even in gold miners away from their work and not exposed to dust the excretion of silica was well above the level for the general population.

All human lungs contain silica and even at birth infants possess appreciable amounts in their lung tissue. It is interesting to know that placental blood is high in silica. In adults the amount of silica present in the lungs tends to increase with age but there is no definite correlation with it. Also from a study of the lungs of 12 unexposed women and 13 unexposed men, we found that on the average the lungs of the males contain more silica than do those of the females. The average figure for the silica content of the lungs of adults who have had no mining or industrial exposure to siliceous dusts, is given as 100 mg.

per cent reckoned on the dried weight of the lung. This means that an adult pair of lungs contains about 1/5 gram of silica. If we assume that the average adult pair of lungs weighs about 1200 grams, then the lungs of approximately 150 people would have to be ashed in order to obtain one ounce of silica. Of course, such figures as these are only averages and do not indicate the extent of the individual variations. In our experiments on normal lungs we have found as low as 25 per cent and as high as 200 per cent of these figures. An alternative method of calculating the silica content of the lungs is by expressing the amount as a percentage of the total lung ash. Reckoned in this way we found the variations in normals to be between 0.25 per cent and 5 per cent. This does not mean, however, that there is a sharp line of demarcation between the silica content of the lungs of silicotics and non-silicotics, but does mean that a chemical analysis cannot be used to support a diagnosis of silicosis if the amount does not exceed these figures.

It is often thought that the siliceous material in human organs is all present in the form of silicon dioxide. This is an erroneous impression as the residues from normal lungs which have been examined for us petrographically by Dr. E. Poitevin, Jr., Chief of the Division of Mineralogy, Department of Mines, Ottawa, show that in addition to the silicon dioxide such silicates as muscovite, biotite, augite and feldspar are present. Furthermore, it is possible that in the living tissues some of the silicon may be in organic combination. Obviously any such compounds in the intact lungs would be destroyed in the preparation of the lung ashes.

The drainage system of the lung is capable of handling the quantity of silica which is inhaled by the average non-exposed individual. However, the inhalation of heavy concentrations of siliceous dusts causes a breakdown of this mechanism and leads to an accumulation of silica in the lungs. The ash of the peribronchial lymph nodes contains relatively large amounts of silica and, as in the lungs, both silica dioxide and silicates are found.

#### *Recent Findings*

In a series of lungs of nine gold miners from the Porcupine area, we found that the amount of silica varied between 470 and 2,800 mg. per cent calculated on the dried weight of lung. Thus these lungs contained between 5 and 30 times the average amount found in the lungs of unexposed individuals. The siliceous portion of the lung ashes contained about equal amounts of silicon dioxide and sericite. As previously mentioned, sericite has been suggested by Jones as being the material which is chiefly responsible for the production of silicosis. The presence of sericite in the lungs of these gold miners is not surprising as this mineral occurs in the rock of the Porcupine area and its mere presence in the lung at the time of death offers no proof that it is a chemically active dust. In fact, animal experiments tend to show that sericite is relatively inert as compared to silica dioxide.

In a further series of lungs of eleven men who have had various types of mining and industrial exposure to siliceous dusts, we found that in general the silicon compounds found in their lung ashes corresponded to the dusts which they inhale during life. Thus men such as sand blasters, who as a result of

their occupation were exposed to dusts which were composed mainly of silicon dioxide, possess in their lung ashes siliceous material of a similar nature. Our records include the case of a sand blaster who had died of uncomplicated silicosis. An analysis of the ash of this man's lung showed that no sericite was present. Last year we had the very interesting case of a man who had been employed as a granite-cutter for nearly thirty years. The concentration of silica in his lungs was sixty times the normal figure and the actual amount weighed nearly an ounce.

The question arises as to whether a chemical analysis can aid in the diagnosis of silicosis. It has been seen that there is a striking correlation between the amount of silica in the dried lung substance and the severity of silicosis as determined histologically. On the basis of his experience, Sladden<sup>5</sup> concludes that fibrosis of an important extent, clearly contributing towards death, is usually present when the silica content of the lungs determined chemically exceeds 1 per cent of the dried weight. Quantities below this are not necessarily negligible but have seldom been associated with deaths attributable to pulmonary disease except where tuberculosis has intervened. When the silica content exceeds 1.6 per cent the fibrosis is, with practically no exceptions, very severe and sufficient in itself to lead to death. In our experience the amount of silica in lung ash is of definite diagnostic assistance, especially when the condition is complicated by widespread tuberculosis.

It is interesting to speculate on the possibility of silicon being a general systemic poison. Recently Collis<sup>6</sup> analyzed the mortality records for the purpose of gaining an insight into the influence exerted upon the human body by the inhalation of siliceous dusts. He says that even if the results for some of the minor causes of death are written off as possibly not significant the picture is extraordinarily striking. Every part of the body seems to be affected, not the respiratory system alone but the circulatory system, the nervous system, and the mortality from the most diverse kinds of disease is high. Such a state of affairs can only be accounted for if it can be definitely accepted that silicon escapes from the lungs to the blood stream and thence exerts its poisonous influence on almost every other part of the body, slowly leading to a more or less general breakdown of the organism. It enters the body by the respiratory system, hence pulmonary tuberculosis, bronchitis or pneumonia may get the fatal blow in first, but if one of these diseases does not kill, the onset of the other diseases is facilitated.

Finally it may be concluded that the silica dust hazard is probably the most widespread and insidious of all industrial hazards within the knowledge of mankind.

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## PROGRESS IN CANADIAN VITAL STATISTICS

REMARKABLE progress has been achieved in Canadian vital statistics since the national system was commenced in 1920. From 1926 returns for the Province of Quebec have been included also so that the complete national system is now in its tenth year. This fact is of great importance. Central compilation makes possible uniformity of treatment and presentation of vital facts which would be quite impossible otherwise. Canada, therefore, is most happily situated in this respect and the foundation for future developments in this field has been well laid. We may therefore look forward with increasing hope toward the successful attainment of more complete and more accurate vital statistics in Canada as the years go by. Education of the public, medical practitioners, and others concerned in notification and certification of births and deaths is the instrument through which most of such progress must be effected.

The recent publications of the Demography Branch of the Dominion Bureau of Statistics are worthy of special attention by all public health workers in Canada. The publication of these reports is further evidence of the excellent work which is being accomplished in vital statistics by the Dominion Bureau at Ottawa. Earlier this year a report upon mortality from certain cardiovascular-renal conditions and nephritis in Canada for the ten-year period 1921-1932 was reviewed in this journal. This report provided basic information in this important field of medical interest. The reports upon mortality by place of residence have also been an outstanding contribution and indicate the importance of the next step in vital statistics—namely, the de jure registration of deaths.

Vital statistics have always been and always will be the "firm basis upon which the whole structure of sanitary science and practice must rest." The researches and ingenuity of Dr. William Farr, who became first compiler of abstracts in the British Register office in London, England, in 1837, raised vital statistics into the sphere of a science and it was his work from 1839 till his death in 1883 which was responsible for many of the sanitary reforms and much of the early public health progress in England. A great deal has happened since the death of William Farr. Our data to-day are much more complete and accurate than were Farr's. We should be able to use them to even greater advantage.

The special report on Mortality in Canada, 1921-1932, just released by the Dominion Bureau of Statistics, is worthy of careful study. This report is discussed in some detail elsewhere in this issue. In the preface to the report Dr. Coats, Dominion Statistician, has indicated that infant and maternal mortality will be made the subject of a third special publication shortly. We shall look forward with interest to the appearance of this further work. The hope is expressed that it may be possible for the two special reports on mortality in Canada, 1921-1932, which we already have, to be combined with this third one and made available in printed form such, for example, as the annual reports issued by the provinces. This would be a most welcome contribution and a further effort on the part of the Dominion Bureau of Statistics in the development of vital statistics and in the promotion of health conservation and public health progress in Canada. Canadian workers to whom these special reports are of concern and interest are especially indebted to Dr. R. H. Coats and his colleagues, particularly to Mr. W. R. Tracey, Chief of Vital Statistics, at Ottawa.

A. H. S.

#### THE LABORATORY SECTION MEETING

THE holding of the fourth Christmas meeting of the Laboratory Section indicates that such a meeting is affording a definite opportunity to those who are interested in bacteriology, pathology, and chemistry as related to public health to present new work in these fields. The Section is therefore serving as the Canadian society of bacteriologists and others who are particularly interested in public health. The Christmas meeting, with the subsequent publication of many of the papers in the JOURNAL, is making possible the presentation of valuable contributions from laboratories throughout Canada. It also provides the opportunity for the full discussion of the findings of various committees of the Section whose studies have a practical bearing on the everyday work of the members.

The work of the committees of the Section may well be mentioned. It is considered desirable to have standard methods for water and sewage analysis and for milk, approved for use in Canada and constituting Canadian standard methods. For several years a committee of the Section has been actively engaged in the study of this question and it is anticipated that definite recommendations will be made at this meeting. The Section has published this year outlines of new laboratory procedures which have been investigated and recommended for trial by a committee of the Section. The committee which has been studying the types of laboratory outfits which are distributed by various provincial and municipal departments of health for the collection and transmission of specimens has made a preliminary report and indicated how definite savings may be made by the introduction of simpler containers which would prove equally satisfactory but considerably cheaper. It is obvious that the Section is making practical contributions which will be greatly appreciated by health administrators as well as by those who are responsible for the immediate direction of laboratory work.

# PROGRAM



## FOURTH ANNUAL CHRISTMAS MEETING LABORATORY SECTION

Canadian Public Health Association

Royal York Hotel, Toronto

DECEMBER 30th and 31st, 1935



MONDAY, DECEMBER 30th

**Opening Session, 2.15 p.m.**—PRIVATE DINING ROOM NO. 1, MAIN MEZZANINE FLOOR.

Registration.

1. Chairman's Address—Dr. W. J. Deadman, Director of Laboratories, Hamilton.
2. Blood Lipids in Leucemia—Dr. Eldon M. Boyd, Queen's University, Kingston.
3. Staphylococcal Infections of the Bovine Udder—Dr. Ronald Gwatkin and Dr. S. Hadwen, Ontario Research Foundation, Toronto, and Dr. H. M. LeGard, Weston, Ontario.
4. Notes on Central Laboratory Aids in the Diagnosis of Enteric Disease—Mr. M. H. McCrady, Dr. L. P. Lebeau, Mr. R. Boudrias, and Mr. J. M. Desranleau, Division of Laboratories, Provincial Bureau of Health of Quebec, Montreal.
5. The Laboratory Identification of the V Form of B. TYPHOSUS—Dr. J. Craigie, Connaught Laboratories and School of Hygiene, University of Toronto.
6. An Epidemic of Bacillary Dysentery in Matane, Quebec—Dr. A. R. Foley, Epidemiologist, Provincial Bureau of Health of Quebec, Quebec.
7. The Animal Control of BCG Vaccine—Dr. A. Frappier and Mr. V. Fredette, Department of Bacteriology, Faculty of Medicine, University of Montreal.

**Dinner, 6.45 p.m.**—ENGINEERS CLUB, 350 BAY STREET.

**Evening Session, 8.00 p.m.**—ENGINEERS CLUB.

1. The American Public Health Association's Standard Methods for Milk Analysis—Dr. Robert S. Breed, Chief in Research, Division of Bacteriology, New York State Agricultural Experiment Station, Geneva.

Round-table discussion:

Canadian Standard Methods (Mr. N. J. Howard); Suggested Laboratory Procedures (Dr. M. H. Brown); classification of Salmonella, the Widal test, and other procedures in the identification of B. TYPHOSUS; and the complement fixation test in smallpox.

## LABORATORY SECTION PROGRAM

TUESDAY, DECEMBER 31st

**Morning Session, 9.15 a.m.**—PRIVATE DINING ROOM NO. 1, MAIN MEZZANINE FLOOR.

Registration.

1. A Case of Typhoid Meningitis—Dr. I. H. Erb and Dr. Viola Rae, The Hospital for Sick Children, Toronto.
2. Bacterial Agglutination with the Blood Serum and Milk Whey of Cattle—Dr. Chas. A. Mitchell, Dr. F. A. Humphreys, and Dr. R. V. L. Walker, Animal Diseases Research Institute, Hull, Quebec.
3. The Health of Animals Branch and its Relation to Public Health—Dr. A. E. Cameron, Chief Veterinary Inspector, Health of Animals Branch, Department of Agriculture, Ottawa.
4. Arsenical Poisoning from a Well Water—Dr. J. Wyllie, Professor of Preventive Medicine, Queen's University, Kingston.
5. The Quantitative Estimation of Indol by Means of Dialysis—Dr. D. C. B. Duff and Dr. Richard Holmes, Department of Bacteriology, University of British Columbia, Vancouver.
6. Bacteriological Study of the New Surgical Mask "Jel": Its Comparative Efficiency—Dr. A. Frappier and Mr. L. Forté, Clinical Laboratory, St. Luke's Hospital, Montreal.
7. Arsenical Poisoning in a Construction Camp—Dr. F. W. Jackson, Deputy Minister of Health and Public Welfare of Manitoba, Winnipeg.

**Luncheon Session, 1 p.m.**—PRIVATE DINING ROOM NO. 10, MAIN MEZZANINE FLOOR.

Speaker—Dr. G. B. Reed, Professor of Bacteriology, Queen's University, Kingston.

Subject—The Socialization of Medicine and Public Health in the Soviet Union.

Report of the Committee on Nominations and Resolutions.

**Afternoon Session, 2.15 p.m.**—PRIVATE DINING ROOM NO. 1, MAIN MEZZANINE FLOOR.

- 2.15 Program of demonstrations. Convenor, Dr. J. S. Kitching, Connaught Laboratories, University of Toronto.
- 3.15. Diphtheria Prevention, Methods and Results—Dr. J. G. FitzGerald, Dean, Faculty of Medicine, Professor of Hygiene and Preventive Medicine, and Director, School of Hygiene and Connaught Laboratories, University of Toronto.  
Some Features of the Epidemiology of Meningococcus (Meningitis)—Dr. G. W. Rake, The Rockefeller Institute of Medical Research, New York.

## DEMONSTRATIONS

(PRIVATE DINING ROOM NO. 4)

- 2.15. Cultivation of gonococci—Dr. J. E. Josephson, Department of Pathology and Bacteriology, University of Toronto.
- 2.25. The identification of colonies of pneumococci by the use of dried bile—Dr. Philip H. Greey, Department of Pathology and Bacteriology, University of Toronto.
- 2.35. Properties of staphylococcus toxin—Dr. J. S. Kitching, Connaught Laboratories, University of Toronto.
- 2.45. Spun-tubes in BR. ABORTUS studies—Dr. Redvers Thompson, Kingston.
- 2.55. Macroscopic test for the staining of brain tissue—Mr. H. E. LeMasurier, Department of Neuropathology, University of Toronto.

## EXHIBITS

The committee in charge of arrangements desires to direct attention to the exhibits of:  
Central Scientific Company of Canada Limited, and Difco Laboratories, Inc.

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Chairman of Local Arrangements—Dr. G. D. W. Cameron.

## LABORATORY SECTION

### THE RELATIVE PATHOGENICITY OF TWO STRAINS OF FIXED RABIES VIRUS FOR WHITE MICE AND RABBITS\*

R. D. DEFRIES and T. C. CAMPBELL

*Connaught Laboratories, University of Toronto*

THE need for a satisfactory laboratory method of determining the protective value of anti-rabic vaccines has been generally realized, particularly by those responsible for their preparation. Although the value of vaccines prepared according to Pasteur's method, and by certain modifications of that method, has been established by world-wide use, yet exact laboratory data as to their antigenic value are not available as no suitable laboratory methods have been developed. Efforts have been made by many laboratories to obtain animal-protection tests, but no procedure has been generally used. Inoculation by the intracranial route of vaccinated animals has invariably proved fatal and inconsistent results have been obtained by intramuscular or subcutaneous inoculation of virus.

In 1934 Reichel and Schneider<sup>1</sup> reported that rabbits which had received large quantities of rabies vaccine (Semple) were resistant to a lethal dose of virus for rabbits when injected into the tongue. Inoculation of control, non-vaccinated rabbits did not always result in the development of the disease, approximately 20 per cent of the control animals not succumbing to the disease.

Although various strains of fixed virus produce rabies when inoculated intracerebrally into rabbits, it is generally recognized that fixed strains differ in their power to produce disease when inoculated intramuscularly or subcutaneously, and in their antigenic properties. A study has been made, therefore, of the Pasteur Institute, Paris, strain of fixed virus and further observations made of the New York City Department of Health

strain to determine the pathogenicity of these two strains for rabbits and particularly for mice when inoculated intracerebrally or intramuscularly. The object was to develop, if possible, a test for the antigenic value of anti-rabic vaccine using mice, the inoculations of virus being made intramuscularly.

#### *Intramuscular Inoculation in Rabbits*

Emulsions (1-10) of both strains were made from fresh rabbit brain tissue of an intracerebral passage in buffered saline (1-25), pH 7, and inoculated into the lumbar muscles. The rabbits used varied in age and weight. A considerable number had been subjected previously to the intracutaneous testing of certain bacterial toxins. There was, however, no indication that the "used" rabbits differed from normal rabbits in the degree of susceptibility to either strain of virus. In table I the findings are presented, giving the number developing paralyzes and the length of the respective incubation periods.

With both strains, doses of 1, 2, and 3 cc. failed to kill all the rabbits inoculated. The number of rabbits inoculated with larger doses of 4 and 5 cc. is not sufficient to indicate that such doses would regularly kill. In two experiments using the New York strain in which thirteen rabbits were used, none developed the disease. The virus used was from one brain only in both instances but in each the rabbit used exhibited typical paralysis following the provocative intracerebral inoculation. From these results there is little difference indicated in the pathogenicity of these two strains when inoculated intramuscularly. The

\*Presented at the Annual Meeting of the Royal Society of Canada, Section V, Subsection of Medical Sciences, Hamilton, Ontario, May 24, 1935.

incubation period of the Pasteur strain is definitely longer, varying from 9 to 28 days, and having an average in this series of 15 days, in contrast to a period of from 7 to 17 days with an average of 10 days when the New York strain was used.

### *Intracerebral Inoculation of Rabbits*

Emulsions were prepared as described for intramuscular inoculation. In each instance the dilution of virus was inoculated immediately instead of being allowed to stand until all the dilutions were made. The dose injected was 0.5 cc.

TABLE I  
INTRAMUSCULAR INOCULATION OF RABBITS  
Pasteur and New York Strains of Fixed Virus

Strain	Date	1 cc.	2 cc.	3 cc.	4 cc.	5 cc.
		No. P. T.*	No. P. T.*	No. P. T.*	No. P. T.*	No. P. T.*
<i>Pasteur</i>	25/8/34		2 1 19			
	8/9/34		2 1 16			
	17/12/34		2 1 12	2 1 9	1 1 12	1 0
	29/11/34			1 0	1 1 16	1 1 16
	8/2/35	3 2 {12 13	3 2 {12 13	3 1 13		
	26/3/35		2 1 12	1 1 16		
	27/3/35		2 2 15	3 2 {10 28		
Sub-total		3 2	13 8	10 5	2 2	2 1
<i>New York</i>	28/11/34			1 0	1 1 8	1 1 10
	17/12/34		1 1 8	1 1 10	1 1 7	1 1 7
	8/2/35	2 0	2 0	2 0		
	22/2/35†	2 1 7	3 3	3 2 {12 13		
	25/3/35		3 2 {8 8	3 2 {8 9		
	2/4/35	1 0	3 0	3 0		
Sub-total		5 1	12 6	13 4	2 2	2 2

†Six pooled brains.

\*No. = Number, P. = Paralysis, T. = Day of paralysis.

TABLE II  
INTRACEREBRAL INOCULATION OF RABBITS  
Pasteur and New York Strains of Fixed Virus

Strain	Date	10 <sup>3</sup>	10 <sup>4</sup>	10 <sup>5</sup>	10 <sup>6</sup>
		No. P. T.	No. P. T.	No. P. T.	No. P. T.
<i>Pasteur</i>	April 17/35	2 2 {13 9	2 1 26		
	April 27/35	2 2 {9 9	2 1 20		
Sub-total		4 4	4 2		
<i>New York</i>	April 17/35	2 2 {8 8	2 2 {8 8		
	April 27/35	2 2 {7 8	2 2 {7 7	2 1 7	
	May 10/35		2 2 {7 8	2 2 {7 8	2 1 6
Sub-total.		4 4	6 6	4 3	2 1

The findings as presented in table II indicate that the New York strain is capable of producing the disease in a dilution of  $10^6$ . The end point in dilution of the Pasteur strain would appear to be  $10^4$ . The incubation period is definitely longer with the Pasteur strain, in contrast with the New York strain in which symptoms are usually evidenced on the 6th day and paralysis on the 7th or 8th day.

#### *Intramuscular Inoculation in Mice*

With both strains, emulsions were made of brain tissue of rabbits exhibiting typical paralysis, which had been stored in pure glycerin in a refrigerator until required. In a few instances, emulsions were prepared from fresh brain tissue. Dilutions were made using buffered saline (1-25), pH 7. White mice were inoculated with 0.2 cc. of the dilution to be tested, being given 0.1 cc. in the thigh muscles of each hind leg. Typical findings are presented in table III.

ly by the development of rabies. Little difference was noted between the two strains. In these studies Swiss mice, which appear to be more susceptible to certain viruses, were used as well as the strain of mice maintained in the Connaught Laboratories colony.

#### *Intracerebral Inoculation in Mice*

Intracerebral inoculations of 0.05 cc. were made of appropriate dilutions of emulsions prepared as previously described for intramuscular inoculations. To avoid the deterioration of the virus when diluted, the inoculations were made immediately after each dilution was prepared.

As typical findings of the inoculation of the New York strain into mice by this route were published in a previous communication,<sup>2</sup> it may be stated that in dilutions of  $10^5$  the inoculated mice regularly develop rabies and frequently in a dilution of  $10^6$ . Pasteur virus, in contrast, generally failed to kill mice in a  $10^3$  dilution, killing

TABLE III  
INTRAMUSCULAR INOCULATION IN WHITE MICE  
Pasteur and New York Strains of Fixed Virus

Date	Virus	Condition of Virus	1-50			1-100			1-200			1-300		
			No.	P.	T.	No.	P.	T.	No.	P.	T.	No.	P.	T.
<i>New York</i>														
7/1/35	A 179	Glycerin 24 hrs.	6	2	10	6	3	12						
23/2/35	A 180	Pooled 6 brains Glycerin 24 hrs.	4	2	7	4	3	8						
15/4/35	A 182	Glycerin 2 days	3	3	8	3	1	9	3	0		3	0	
Sub-total			13	7		13	7		3	0		3	0	
<i>Pasteur</i>														
28/9/34	P.R. 4	Pooled 2 brains Glycerin 24 hrs.	4	4	11	2	0							
25/1/35	P.R. 5	Pooled 2 brains Glycerin 29 days	8	2	13	4	4	10	4	2	10	4	3	10
20/2/35	P.R. 7	Glycerin 12 days	4	4	9	4	4	10	4	2	10			
Sub-total			16	10		10	8		8	4		4	3	

From the findings in table III it is evident that inoculation by the intramuscular route is not followed regular-

approximately fifty per cent of the inoculated animals in a  $10^4$  dilution and one hundred per cent in a  $10^3$

dilution. The incubation period also is definitely longer, being from 8 to 10 days with the Pasteur strain.

#### Mouse Passage Experiments

With the hope of increasing the virulence of the New York strain for mice and of obtaining more consistent results, passage by intramuscular inoculation was tried and the results recorded in a previous publication.<sup>2</sup> Passage of one of these strains, B<sub>2</sub>, has been continued (50 passages) and in recent passages evidence of increased pathogenicity has been shown by the killing of mice in dilutions of from 1-200 to 1-500.

A similar effort has been made using the Pasteur strain which has now received 26 mouse passages. In table IV the findings are presented. The strain is referred to as "P.M."

genicity for mice. When injected intramuscularly no greater consistency was found than with the Pasteur and the New York strains of fixed virus. This strain when inoculated intracerebrally regularly killed mice in a dilution of 10<sup>5</sup> but not in higher dilutions.

#### SUMMARY

(a) Minor differences only have been found in regard to the minimum lethal doses of the New York strain and the Pasteur strain of fixed rabies virus when inoculated intramuscularly and intracerebrally in rabbits and white mice.

(b) The incubation period is definitely longer with the Pasteur strain in the development of rabies in both rabbits and white mice.

(c) Pasteur fixed virus when pass-

TABLE IV\*  
MOUSE PASSAGE USING PASTEUR STRAIN  
Intramuscular Route—Strain "P.M."

Date	Passage No.	1-100 No. P.	1-200 No. P.	1-300 No. P.	1-500 No. P.	1-600 No. P.	1-700 No. P.	1-900 No. P.	1-1200 No. P.
28/8/34	1	2 1	2 0	.....	.....	.....	.....	.....	.....
31/1/35	7	2 2	2 2	1 1	.....	.....	.....	.....	.....
24/6/35	17	2 2	.....	2 2	2 1	2 2	.....	.....	.....
16/8/35	20	4 4	.....	4 4	4 2	.....	2 2	.....	.....
28/10/35	24	6 6	.....	8 4	2 2	6 6	2 1	8 7	2 1

\*Table revised at date of publication to include recent findings.

It appears from these results that the Pasteur strain has become more pathogenic by passage when inoculated intramuscularly in white mice. This strain is therefore the most suitable of the several strains studied for intramuscular inoculation in mice in the performing of tests to determine the protective value of anti-rabic vaccine.

Recently Webster and Dawson<sup>3</sup> inoculated Swiss mice with rabies street virus and subsequently passaged several of these strains through mice. One strain which had had 14 passages was kindly sent to us and observations were made in regard to its patho-

genic through mice using intramuscular inoculations gives evidence of an enhanced pathogenicity for mice when the virus is injected intramuscularly. Such virus after 26 passages would appear to be useful in the testing of the antigenic value of anti-rabic vaccine.

#### REFERENCES

- <sup>1</sup>Reichel, John, and Schneider, J. E. *Am. J. Pub. Health*, 1934, **24**:625-628.
- <sup>2</sup>Defries, R. D., and Campbell, T. C. 1934, *Trans. R.S.C.*, 105-110.
- <sup>3</sup>Webster, L. T., and Dawson, J. R., Jr. 1935, *Proc. Soc. Exper. Biol. & Med.*, **32**:570-573.

# EPIDEMIOLOGY AND VITAL STATISTICS

## MORTALITY IN CANADA—1921-1932

A. HARDISTY SELLERS, B.A., M.D., D.P.H.

*School of Hygiene\*, University of Toronto*

THE Demography Branch of the Dominion Bureau of Statistics has recently published a special report on Mortality in Canada, 1921-1932. The statistical data given include crude mortality rates for all causes and certain important diseases or disease groups, as well as age and sex specific rates and standardized rates for the census years. Comparability of the data has been effectively maintained for the period studied by appropriate selection of titles so that the effects of changes produced by the revision of the International List in 1929 are eliminated.

In the February issue of the *Journal* attention was drawn to the special report on mortality from certain cardiovascular diseases and nephritis in Canada for the same period, also prepared by the Dominion Bureau of Statistics. The essential features of the trend in mortality from these causes as indicated in this report were pointed out at that time and no further reference will be made to that group in this communication.

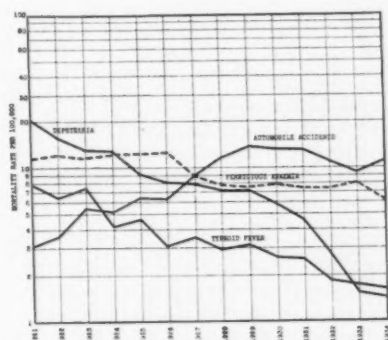
### *Mortality from Certain Causes*

Using the data provided by this report, the accompanying diagrams have been constructed to illustrate the trend of the *crude* mortality rates (deaths per 100,000 population) for a selected group of diseases.

Some of the major developments in the public health field during the past 12 years are illustrated by these diagrams. In figure I the marked decline in mortality from diphtheria and typhoid fever is noteworthy. Striking contrast to these trends is given by the mortality from automobile accidents. This problem is a real one and will become more so as the wheels of industry and commerce again begin to gain momentum—unless something is done about it.

No measure of control yet known is specific and wide public co-operation is necessary. It is important to draw attention to the fact that the mortality from diarrhoea and enteritis among the population is *greater* than that from automobile accidents. It is likewise greater than the mortality from diabetes mellitus or even from diphtheria, measles, whooping cough, scarlet fever, and typhoid and paratyphoid fevers combined.

FIGURE I



Mortality from certain causes of death, Canada†, 1921-1934‡. *See also Fig. 2*

The effect of modern therapy in disease control and prolongation of life is evident in the trend in mortality from pernicious anaemia. The introduction of liver treatment in 1927 has been accompanied by a significant decline in mortality which has thus far been maintained. In this disease as in diabetes the important factor in control is provision and maintenance of adequate treatment and it is this aspect which offers many difficulties in a large and relatively thinly populated nation like Canada.

\*From the Department of Epidemiology and Biometrics.

†Registration Area as of 1921. ‡1934 rates based on preliminary figures.

Figure II shows that the trend in mortality from pulmonary tuberculosis has been slowly and persistently downward, as has been that from pneumonia. To what extent this latter decline is the result of more complete and accurate certification is unknown. The downward trend in deaths from diarrhoea and enteritis is encouraging and doubtless a reflection of health teaching and improvement in infant care and feeding practice. The trend of cancer mortality on the other hand is persistently upward. How much of this increase is apparent and how much real can never be

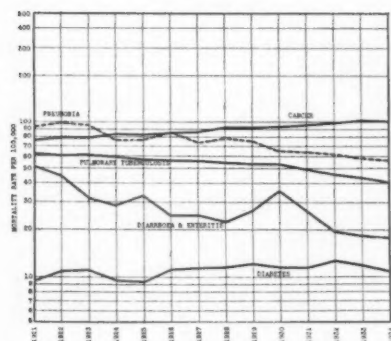
proportion of the population to ages at which diabetes is most prevalent, as well as failure to maintain treatment or co-operation and improper certification, among other things, offer a tangible explanation.

#### *The Influences of Changes in Population Structure on Mortality*

The data used in figures I and II were, of course, crude death rates. It should, therefore, be pointed out that the trends in certain instances, particularly in the degenerative diseases, cancer and diabetes mellitus, are not entirely real. The risk of dying from a given cause varies greatly from birth to old age. There are specific differences in the two sexes also. Consequently, comparison of crude mortality rates in time would be sound, other things being equal, only if no change in the sex or age composition of the population occurred during the period. The declining birth rate, and the declining death rates at all ages under 60 years during the last three decades, among other factors, have effected a reduction in the proportion of young persons compared to the proportion of old individuals in the population. The influence of this change in population structure is discussed in this special report from the Dominion Bureau of Statistics. Table I is an extract from the report, giving crude and standardized rates for the census years 1921 and 1931 for certain causes of death.

In the case of cancer, for example, the crude rate increased by 27 per cent from 1921 to 1931, while the standardized rate of 1931 (based on the standard million population of England and Wales, 1901) showed an increase of only 12 per cent. Therefore, more than half of the increase in mortality from cancer during this period is due to "aging of the population". In diabetes also the influence of changing age constitution of the population is manifest, the apparent

FIGURE II



Mortality from certain causes of death, Canada\*, 1921-1934†

decided with certainty, though improvement in the accuracy of diagnosis of invisible cancers is an important consideration. (Vide infra.)

Figure II also indicates that mortality from diabetes mellitus showed an initial decline following the general introduction of insulin in 1923. This initial improvement has not been maintained, however, and the subsequent rise in mortality is not readily explained. Improvement in accuracy of diagnosis may be an important factor, but improvements in standards of living, the survival of an increasing

\*Registration Area as of 1921.

†1934 rates based on preliminary figures.

increase being 22 per cent while the standardized rate of 1931 showed only a 10 per cent increase over that of 1921.

the most valuable practical features of the work. Crude death rates, even standardized rates, for various diseases give little except a general

TABLE I  
CRUDE AND STANDARDIZED MORTALITY RATES FOR CERTAIN CAUSES  
CANADA\*, 1921 AND 1931

Disease	Crude Rate		Standardized Rate	
	1921	1931	1921	1931
Diseases of heart.....	94.0	118.0	89.2	97.1
Cancer.....	75.3	95.8	72.7	81.4
Pneumonia (all forms).....	93.1	63.3	89.7	61.2
Pulmonary tuberculosis.....	60.9	49.0	62.1	48.6
Diseases of arteries.....	39.2	68.2	36.3	54.4
Nephritis.....	31.9	41.0	30.4	34.2
Diphtheria.....	20.2	4.6	19.8	5.1
Diabetes mellitus.....	9.5	11.6	9.4	10.3
Typhoid fever.....	7.8	2.5	7.8	2.5

\*Registration area as of 1921.

#### *Registration of Indian Deaths and Tuberculosis*

The influence of increasing completeness of registration of Indian deaths on tuberculosis mortality rates is also discussed in the report. For the earlier part of the period reviewed the registration of Indian deaths was very incomplete. There has, however, been continuous improvement in this respect since 1921, thus rendering the data somewhat incomparable over the period. In the case of deaths from tuberculosis this is particularly evident, the rate inclusive of Indians falling from 74.7 in 1931 to 55.2 per 100,000 in 1932, while excluding Indian deaths the rate fell from 73.3 to 46.6. The increasing completeness of the Indian records has therefore served to some extent "to mask the actual decline in mortality from this cause."

#### *Specific Death Rates*

Specific death rates at ages for certain causes of death are also provided in this report. This is one of

picture of a disease problem. In order to attack such a problem effectively one must know where the keystone lies. Thus the crude mortality rate for whooping cough in 1931 was 5.6 per 100,000 population, the standardized rate 6.7. Age specific death rates, however, reveal the striking fact that among children under 5 years of age the rate was 55.7 per 100,000 population at these ages. The specific toll of all other diseases is similarly reflected by these age specific death rates, serving to indicate in a general way the spot at which preventive measures must be particularly aimed.

#### *Conclusion*

This report is of substantial practical use and interest to all those anxious to become aware of the health status of the population of Canada. In each province there are problems which are of particular importance—others are common to all. The report is a timely one and should be welcomed by all field workers in public health. It deserves careful study.

REPORTED CASES OF CERTAIN COMMUNICABLE DISEASES IN CANADA\*  
BY PROVINCES—May to August, 1935

Disease	Month	P.E.I.	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
Diphtheria . . . . .	May	..	8	3	62	23	13	7	..	7
	June	..	12	3	62	29	28	5	1	2
	July	..	14	5	82	37	17	9	1	..
	Aug.	..	3	8	49	10	18	8	1	..
Scarlet Fever . . . . .	May	..	49	9	705	585	51	29	38	138
	June	2	81	9	522	594	74	21	20	108
	July	1	53	22	314	350	54	32	14	46
	Aug.	7	28	3	150	124	40	10	18	42
Measles . . . . .	May	..	178	117	2985	7767	434	294	330	359
	June	..	57	90	1795	5163	266	128	714	641
	July	..	19	41	572	3038	214	389	170	473
	Aug.	..	3	30	98	349	54	21	14	79
Whooping Cough . . . . .	May	..	6	3	305	687	209	273	16	331
	June	..	16	7	185	534	130	174	66	174
	July	..	37	13	253	659	142	285	22	100
	Aug.	..	28	5	251	648	66	198	6	42
German Measles . . . . .	May	..	108	..	321	4296	33	13	7	37
	June	..	21	..	255	4806	43	127	3	12
	July	..	7	..	43	1187	16	85	7	14
	Aug.	..	..	..	7	65	..	4	2	2
Mumps . . . . .	May	..	48	3	166	1090	617	34	94	83
	June	..	51	..	51	705	471	59	22	64
	July	..	26	..	29	348	129	46	7	24
	Aug.	..	6	..	17	87	48	107	16	39
Smallpox . . . . .	May	..	..	..	..	1	..	1	..	..
	June	..	..	..	..	..	..	..	..	1
	July	..	..	..	..	2	..	..	..	..
	Aug.	..	..	..	..	..	..	..	1	1
Cerebrospinal Meningitis . . . . .	May	..	2	..	3	2	..	..	..	..
	June	..	..	..	2	2	..	1	..	..
	July	..	..	..	6	1	1	..	..	..
	Aug.	..	..	..	1	..	..	1	..	..
Anterior Poliomyelitis . . . . .	May	..	..	..	3	1	..	..	..	..
	June	..	..	..	4	2	1	1	2	1
	July	..	..	..	5	6	1	..	5	1
	Aug.	..	..	..	3	27	3	..	21	5
Typhoid Fever . . . . .	May	..	..	3	92	17	3	4	3	2
	June	..	4	1	70	18	2	4	5	13
	July	..	..	10	100	19	4	5	4	16
	Aug.	6	..	11	118	39	13	19	2	6
Trachoma . . . . .	May	..	..	..	..	..	2	1	..	5
	June	..	..	..	1	..	1	19	..	1
	July	..	..	..	..	..	1	1	..	5
	Aug.	..	..	..	..	..	..	..	..	3

\*Data furnished by the Dominion Bureau of Statistics, Ottawa.

September and October, 1935

Disease	Month	P.E.I.	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
Diphtheria . . . . .	Sept. Oct.	.. ..	13 13	9 25	71 142	30 37	18 32	7 17	3 2	2 4
Scarlet Fever . . . . .	Sept. Oct.	2 10	33 53	6 16	327 659	261 706	64 237	16 71	35 79	63 121
Measles . . . . .	Sept. Oct.	3 16	35 4	444 363	79 517	329 1043	7 58	50 233	34 56	144 368
Whooping Cough . . . . .	Sept. Oct.	6 1	33 56	.. 56	279 290	533 522	98 211	210 162	35 23	29 53
German Measles . . . . .	Sept. Oct.	.. ..	4 ..	.. ..	6 64	30 141	1 ..	20 50	2 4	37 16
Mumps . . . . .	Sept. Oct.	.. ..	36 68	.. ..	16 67	130 482	93 244	405 1829	22 19	40 184
Smallpox . . . . .	Sept. Oct.	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	3 ..	.. ..	5 2
Cerebrospinal Meningitis . . . . .	Sept. Oct.	.. ..	1 ..	.. 4	8 4	2 1	.. 1	.. 1	1 1	1 ..
Anterior Poliomyelitis . . . . .	Sept. Oct.	1 ..	2 ..	2 ..	2 18	40 14	12 6	5 7	83 34	7 3
Typhoid Fever . . . . .	Sept. Oct.	10 7	8 4	38 45	144 153	104 52	11 18	13 13	2 9	13 6
Trachoma . . . . .	Sept. Oct.	.. ..	.. ..	.. ..	.. ..	.. 1	4 ..	1 ..	.. ..	23 10

## NEWS FROM THE FIELD

### Eighth Convention of the Saskatchewan Health Officials' Association

THE eighth convention of the Saskatchewan Health Officials' Association was held in Hotel Saskatchewan, Regina, on October 16th. Following the formal opening, Dr. T. A. Patrick presented his address as President of the Association. Three section meetings presenting subjects of special concern to medical health officers, to public health nurses, and to the group of sanitary officers and veterinary surgeons, followed the President's address. The health officers section was led by Dr. J. G. K. Lindsay, the public health nurses by Miss G. C. McDonald, Regina, and the group of sanitary officers by Dr. F. M. Gray, Estevan.

Although detained at Saskatoon, Dr. J. W. MacNeil, Commissioner of Mental Ser-

vices, Department of Public Health, was able to arrange for the presentation of his address by radio. The Association was addressed in the afternoon by Dr. R. O. Davison, Deputy Minister of Public Health, and résumés of the section meetings were presented by the chairmen of the morning sessions. The next convention will be held in the new Bessborough Hotel in Saskatoon.

The following officers were appointed for the ensuing year: *Patrons*: His Honour the Lieutenant-Governor of Saskatchewan; the Hon. W. J. Patterson, Premier; and the Hon. J. M. Uhrich, M.D., Minister of Public Health; *Honorary President*, R. O. Davison, M.D., Deputy Minister of Public Health; *President*, W. H. Orme, V.S., Saskatoon; *Vice-President*, J. G. K. Lind-

say, M.D., Lumsden; *Executive*, W. H. Appleton, Saskatoon; W. J. Brawley, M.D., Wynyard; T. Douglas, Weyburn; Miss G. C. McDonald, Reg.N., Regina; Miss M. E. Pierce, Reg.N., Shaunavon, and C. Rose, M.D., Simpson; *Secretary-Treasurer*, R. H. Murray, C.E., Regina.

**Appointment of the Hon. William F. Roberts, M.D., as Minister of Health and Labour for New Brunswick**

**A**NNOUNCEMENT was made early in July, following the provincial elections in New Brunswick, of the appointment of the Honourable William Francis Roberts, M.D., as Minister of Health and Labour in the new government. Born in Saint John in 1869, Dr. Roberts received his early education in that city. Choosing the practice of medicine as his life work, he graduated from Bellevue Hospital Medical College, New York City, receiving the degree of M.D., and returned to his native province to practise. In 1917 he was elected to the Provincial Legislature and had the distinguished honour of being appointed Minister of Health, the first such appointment to be made in the British Empire. In this office, in which he remained until 1925 during the two terms in which his government continued, he introduced an effective public health program, including a provincial system for the registration of vital statistics.

In returning as Minister of Health the Honourable Dr. Roberts brings the same enthusiasm for the advancement of public health that characterized his earlier years of service. Active in fraternal societies, he has also given freely of his time to the Kiwanis Club, serving as Chairman of the Public Affairs Committee of the Canada Kiwanis International, and to the Canadian Red Cross Society and other social agencies. He is a Past President of the Canadian Public Health Association and of the American Academy of Physical Therapy.

**Appointment of the Hon. Mark R. McGuigan, K.C., B.A., as Minister of Health and Education for Prince Edward Island**

**F**OLLOWING the provincial elections in Prince Edward Island the Honourable Mark R. McGuigan, K.C., B.A., has been appointed Minister of Health and Education, succeeding the Honourable W. J. P. MacMillan, M.D. Mr. McGuigan was born in Hope River in 1894. He was graduated in arts from St. Dunstan's University in 1914 and completed his training in law in 1918, when he was admitted to the Bar. He was created K.C. in 1930.

Announcement has been made also of the appointment of Dr. B. C. Keeping, D.P.H., formerly Chief Health Officer, as Deputy Minister of Health.

## BOOKS AND REPORTS

**Preventive Medicine and Hygiene.** By Milton J. Rosenau, Professor of Preventive Medicine and Hygiene, Harvard Medical School. Sixth edition. Published by D. Appleton-Century Company, Inc., New York, 1935. 1481 pages. Price \$10.00.

The sixth edition of Professor M. J. Rosenau's textbook, "Preventive Medicine and Hygiene", will be well received. It has long since become established as a standard textbook both for medical students and for more advanced students in various fields of public health.

Extensive changes have been necessitated throughout the volume in order to bring the subject up to date. In this sense the book is really a new one. Much new material has been added to the sixth edition and this makes the volume of even greater value than ever before. Indeed, little that is of interest to students of public health has been omitted. For the first time, contraception, maternal mortality, diabetes, periodic health examination, and several other sub-

jects are included. These additions are welcome and serve to emphasize the broadening scope of preventive medicine, which now concerns itself not only with diseases of epidemic character but with all risks to health.

The inclusion of a full list of references at the end of the various sections is a particularly useful feature. As usual the text is well written and effectively illustrated. If any suggestion might be offered, it would be in keeping with the thought of the author as expressed in the preface to the first edition, namely of dividing the material into two appropriate parts, Hygiene and Sanitation. Such a division might permit of the publication of the material in two separate volumes. It is indeed a great service which Dr. Rosenau has rendered to public health workers throughout the world by the preparation of this classical work.

Rosenau's textbook of Preventive Medicine and Hygiene is unequalled as a source of the fundamental information and basic

principles which every health officer should know, and the new edition will be heartily welcomed.

A.H.S.

**National Health Insurance.** G. F. McCleary, M.D., formerly Principal Medical Officer, National Health Insurance Commission (England); and a Deputy Senior Medical Officer, Ministry of Health. Published by H. K. Lewis & Co., Ltd., 136 Gower St., London, W.C.1, England, 1932. 185 pages. Price 6s. net.

This book is based upon two De Lemar lectures which were given by Dr. McCleary at the School of Hygiene, Johns Hopkins University. The object which the author had in mind was to summarize concisely the chief facts so that it might serve as a suitable introduction to the study of health insurance.

The development of health insurance on a voluntary and on a compulsory basis, which is the theme of the opening chapters of the book, forms a background for the consideration of the more recent advances in this field of social reform. The author then outlines the scope, organization, and finance of national schemes for health insurance.

Health insurance benefits, statutory and additional, and benefits in cash and in kind, are discussed briefly. The present tendency is, of course, to attach greater importance to the benefits in kind—medical services—than to cash payment, a reversal of the earlier trend where the chief object was to compensate a worker for loss of wages. This change of opinion and policy doubtless foreshadows the ultimate development of schemes of national health service apart entirely from reimbursement for wages lost by sickness.

Dr. McCleary has devoted the major portion of his exposition to the English national health insurance plan—one with which he was for many years closely associated as principal medical officer to the national health insurance commission. The account which he gives of the steps leading to the introduction of the scheme is of practical value to those interested in health insurance in areas where no adequate provision is yet made.

Later chapters contain a description of the English national health insurance scheme from the viewpoint of benefits, administration, arrangements for providing medical services, and conditions of insurance medical service. The author frankly discusses cer-

tain difficulties which have arisen in connection with the scheme as well as certain criticisms which active opponents have offered. Methods by which many abuses of the system may be checked are considered.

The two closing chapters deal briefly with the social value and the future of health insurance. There is no doubt that strong evidence of the value and growing appeal of national health insurance exists. In reference to the future, the author indicates that certain tendencies are quite significant as, for example, the tendency to place health insurance on a compulsory basis, to extend the number of occupations covered and to extend the medical benefits to families of insured persons; as well as the increasing emphasis upon the provision of medical services rather than upon cash payment.

Dr. McCleary's book gives such a concise and clear exposition of the origin and development of national health insurance and so well describes the initiation and operation of the English plan that it fulfills its purpose as an introduction to this important social problem. Students in post-graduate courses in public health will read this book with great profit. For those who wish to pursue the subject a list of references is included. The reviewer knows of no other book which brings together so much information on this subject in such small space.

A.H.S.

**Annual Report of the Department of Public Health of the Province of Nova Scotia for the Fiscal Year Ending September 30, 1934, and the Report of the Deputy Registrar General for the Calendar Year 1933.** P. S. Campbell, M.D., Chief Health Officer and Deputy Registrar General. 1935. 268 pages, including 60 tables.

The annual reports of departments of health have a definite function to perform for public health. Their content and purpose were, of course, originally dictated by a statutory requirement. It is not, however, in fulfilling this requirement that their full value lies. The annual report upon the state of the public health serves to give the health officer the opportunity to present the year in review, to note what has been done and what remains to be done. It provides a logical opening for the presentation of the highlights of success and failure during the past year as indicated by current vital statistics and for comment upon local problems and the discussion of new developments bearing upon the public health field.

Dr. P. S. Campbell's report upon health for the year ending September 30, 1934, is most encouraging. The important problems concerning the health of the people, cancer, heart disease and tuberculosis, measles, diphtheria, scarlet fever and whooping cough, as well as typhoid fever, infantile paralysis and venereal disease, are discussed briefly in turn. This section of the report is terse and clear and may be read with great profit and interest by medical men and laymen alike. The text is not merely a statistical statement of past experience but rather gives an indication of the problems which exist and the weapons of control at our disposal. In the case of diphtheria, for example, Dr. Campbell indicates briefly the method of prevention and control and urges all parents to see that their children are immunized. The record of this province in typhoid fever is enviable, no outbreak due to infected water or milk having occurred for over ten years.

In presenting the vital statistics report, as Deputy Registrar General for the province, Dr. Campbell points out that "few people give serious thought to the importance of accurate and complete registration. Health officials are constantly using the accumulated data in a study of the general health conditions of the province. Vital statistics furnish such officials with a valuable guide in the development of policies that will lead to mitigation of suffering, disease, and the conservation of life. In order that there shall be accuracy and completeness in assembling such important tabulations, physicians, undertakers and many other individuals must cooperate with the local registrars, by providing the valuable data required. Every person who furnishes the information required, promptly and completely, is performing a public service of inestimable value to the whole province."

Detailed statistical information is given in 60 tables. It is of note that almost 50 per cent of the infant deaths during the year occurred in infants at or beyond one month of age; an indication that, even with our present knowledge, much progress remains to be made in reducing the infant death rate in Nova Scotia.

The reports of the Divisional Medical Health Officer, Director of the Provincial Laboratory, Provincial Pathologist and Superintendent of the Nursing Service are also appended. During the fiscal year, 38,

215 specimens were examined and reported upon in the laboratory and 2,282 specimens of tissue were received by the provincial pathologist, an increase of 36 and 51 per cent respectively over the preceding year.

In constructive criticism the reviewer feels that the absence of any form of index to this 268-page report is unfortunate, particularly for the person who is interested in perusing the statistical data. The provision of such a guide to the tables and text of the report would be a valuable addition. A page devoted to an outline of the personnel of the Department, with an indication of the duties and relationships of each, would be an excellent preface to the report.

A.H.S.

#### **Communicable Diseases for Nurses.** By

Albert G. Bower, M.D., Head of Department of Communicable Diseases and Clinical Professor of Medicine, University of Southern California, Los Angeles; and Edith B. Pilant, Reg.N., Superintendent of Nurses, Communicable Disease Section, Los Angeles General Hospital. Third edition, reset, 1935. Published by W. B. Saunders Company, London and Philadelphia. Canadian agents, McAinsh & Co. Limited, 388 Yonge Street, Toronto. 420 pages, 51 illustrations. Cloth, \$3.50.

"Communicable Diseases for Nurses", which first appeared in 1929, is now in its third edition. As its title indicates, the book is primarily written for the use of student nurses and for this purpose it is admirably suited.

The text of this edition has been completely revised and many new features have been added. The introductory chapters are devoted to a concise outline of some of the basic principles of communicable disease work. Sections on immunity and infection, medical aseptic technique, and the care of the communicable diseases in the home, follow. The major part of the volume is occupied by a terse discussion of the important communicable diseases. The practical value of the book is enhanced by the particularly effective chapters dealing with the acute communicable diseases of childhood. A valuable and commendable feature is the provision of a glossary of the medical terms used in the text.

A.H.S.





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# Time for Bed

## SLEEP REQUIRED BY THE AVERAGE CHILD

One of the most valuable things you can do for your child is to insist that he gets enough sleep. Make sure that he receives his full amount of Nature's great builder and restorer—sleep.

Age	Hours of sleep needed
At birth	- 20 to 22 hours*
At 6 months	- 16 to 18 hours*
At 1 year	- 14 to 16 hours*
2 to 3 years	- 13 to 15 hours*
6 to 7 "	- 12 hours
8 to 10 "	- 11 hours
11 to 12 "	- 10 to 11 hours
13 to 15 "	- 10 to 12 hours

\*Including daytime sleep

(Compiled from U.S. Children's Bureau Folder 11, "Why Sleep?")

**C**HILDREN must have the proper amount of sleep in order to grow, to fight off disease, to become alert mentally and strong physically. Foremost child experts prescribe the definite amounts of sleep which children should have at various ages (shown in the chart). A child should be in the right frame of mind when he goes to bed. If he has been unduly excited, it is difficult for him to relax.

Adults, too, should have the proper amount of sleep. Each day they burn up tissue which rest helps to restore at night. During hours of physical and mental activity the body accumulates fatigue poisons which are thrown off in sleep.

Pain, worry, bad digestion are sleep-thieves. Prolonged loss of sleep makes one irritable and below par, mentally and physically.

The tendency to insomnia may often be successfully combated in various ways—sometimes by taking a walk before going to bed—reading a non-exciting book—drinking a cup of hot milk, but above all, by learning to relax. Let go of every muscle, ease every tension, drop your problems until tomorrow and yet yourself sink into the bed instead of holding yourself rigidly on top of it. Even though you do not actually go to sleep, such repose will bring a good measure of health repair. But when loss of sleep is persistent, a physician should be consulted.

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